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Iron is present in the food in the simple form of soluble iron salts and compounds of iron hydroxide with protein, and also in the complex form of hæmin derivatives—hæmoglobin, cytochrome, and other respiratory ferments of a porphyrin structure. Feeding experiments on animals indicate that only about half the iron in the food can be assimilated. The available iron of the food seems to correspond closely with the simple forms of iron, which can be estimated by chemical reactions such as Hill's dipyridil method. Hæmin derivatives do not give these reactions, and they appear to escape absorption in the alimentary tract. Practically all of the iron of simple inorganic salts is available, and preparations such as ferric chloride, when accompanied by traces of copper, can be used as the sole source of iron in the diet of experimental animals. It appears that all compounds of iron must be broken down into simple salts before the iron can be assimilated, and that the hæmin compounds resist this process, so that their iron is not available to the organism.[1,2]

Iron is absorbed chiefly in the duodenum but the stomach and the whole of the small intestine may take part in the process. The upper part of the alimentary tract is an all-important area in hæmopoiesis and the surgeon should avoid too ruthless an exploitation of this territory. The body of the stomach secretes pepsin and the powerful mineral acid, hydrochloric acid, which is the solvent for the available iron of the food. So abundant is the gastric secretion in health that it more than suffices to neutralise the alkaline juices of the liver, the pancreas, and the intestine, and the reaction of the whole of the small intestine is acid. The pyloric portion of the stomach and the upper duodenum secrete a ferment which reacts with an extrinsic factor in the food to produce the liver principle. The duodenum is the chief site of iron absorption. The available iron of the food is probably reduced to the bivalent ferrous state in the alimentary tract, and after absorption it is either stored or transported to those places where it is required for its catalytic action and for the building of hæmoglobin. Iron is taken up by the nuclei of the erythroblasts, which elaborate hæmoglobin from it and are extruded from the ripening cell when their task is completed. Iron is also taken up by the other cells of the organism for the manufacture of cytochrome and other respiratory ferments. However administered, iron is excreted by the cæcum and large intestine, and little appears in the urine even when iron is introduced parenterally (Fig. 1).

We might expect to find that in health the absorption of iron by the stomach and small intestine would be equalised by the loss through the colon. Whether there is such an equilibrium, and, if so, how it is adjusted, are matters on which at present we have no trustworthy information. The administration of iron to normal animals and men does not affect the blood count, but much of the iron may be retained in the body. Absorption is proved by the rise in the serum iron, by the toxic effects of high dosage of iron in animals, by the investigation of patients with ileal fistulæ, and by balance experiments. The estimation of iron in animal tissues and excretions is so difficult and the results of analyses of standard biological materials such as milk and serum are so divergent, that we can place no great reliance on the records of balance experiments. Lintzel, experimenting on healthy individuals, concluded that not more than 17 mg. of iron was retained,

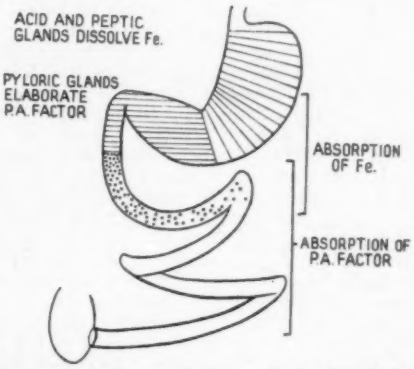

FIG. 1.—The hæmopoietic area of the alimentary tract.

however large a single dose was given. He assumed that there was an intestinal barrier to the absorption of iron, and stated that there was no advantage in prescribing more than 50 to 100 mg. of iron a day. His results are at variance with experience in the treatment of anæmia, for the hæmoglobin increment may correspond with a utilisation of 50 mg. or more of iron a day, and maximum improvement may not occur until large doses of iron are given. Moreover, Reimann and Fritsch gave patients with anæmia 100 mg. of iron a day and found that approximately 50 mg. a day was retained; only about 20 mg. a day could be attributed to the manufacture of hæmoglobin and the remaining 30 mg. were stored in the body. At the 1935 meeting of the Association of Physicians J. F. Brock reported iron retention of this order occurring for many weeks in patients receiving large doses of iron, so that a subsequent speaker was constrained to say that the patients must be converted into pillars of iron. If these results are confirmed we must believe that patients treated with iron store the metal, in amounts as large or larger than those found in hæmochromatosis, without developing siderosis of the organs; and as anæmic patients treated with large doses of iron may quickly relapse on omitting iron, we must believe that the iron they have sequestered (? in the bones) is a frozen credit which they cannot liquefy. Hæmochromatosis, on the other hand, is probably the result of an inborn error of metabolism which affects the disposal of endogenous and not exogenous iron.[4,5]

Two other curious facts may also be mentioned. The first is described by Schulten as the "threshold phenomenon." We may, for example, treat a patient for many weeks with a daily dose of 30 grains of iron and ammonium citrate with no apparent effect; on raising the dose to 60 grains of iron and ammonium citrate a day there is a reticulocyte crisis and the anæmia is steadily repaired. Thus there is a minimal effective dose of iron. In other patients who are treated with a suboptimal dose of iron (which is

far larger than any diet could supply) the anæmia may improve for a few weeks and then become stationary at a higher but still subnormal level. In both these conditions it is difficult to explain why the anæmia does not slowly but steadily improve.

Iron Requirement

The professional fasting men, Cetti and Breithaupt, excreted about 10 mg. of iron a day during their periods of starvation, but the excretion of iron is abnormal during fasting owing to tissue breakdown. Lintzel showed that adult males can be balanced on a diet containing less than 1 mg. of iron a day, but much more iron is needed by the growing child and by the female during her reproductive life. The iron requirement in childhood has been estimated at 0·76 mg. per 100 calories of food ingested.[4] In the female the reproductive function imposes an extra strain on the iron metabolism. Normally about four ounces of blood are lost at each period, or 50 mg. of iron, but in menorrhagia as much as 200 mg. may be lost.[7] During pregnancy a total of 0·9 gramme of iron must be supplied from the food or the body reserves, or an average daily storage of 3·2 mg.[8] Under fairly ideal conditions of diet and well-being, it seems possible for the maternal organism to assimilate enough iron for this purpose, assuming that the diet contains 15 to 20 mg. of iron a day, that half of this iron is "available," and that half of the available iron is absorbed. During lactation from 1 to 1·5 mg. of iron a day are secreted in the milk. Reproduction is a test not only of the maternal constitution but also of the standard of living, and a large section of the British community comes through the test badly. Davidson and co-workers have shown that diets averaging 11 mg. of iron a day, such as are taken by the poor in the Aberdeen area, are insufficient to maintain iron equilibrium in females who have begun to menstruate.

In addition to the physiological states which increase the requirement of iron, there are pathological conditions which impair its absorption and give rise to a "conditioned deficiency." The most important is achlorhydria. Impairment of the gastric secretion is found in a high proportion of cases of nutritional anæmia in infancy and childhood,[1 18] idiopathic hypochromic anæmia,[17] and hypochromic anæmia of pregnancy.[44] A diet high in iron usually has little demonstrable effect on simple achlorhydric anæmia, but if the food is predigested with hydrochloric acid and pepsin there may be a favourable response.[2 9 26] The optimum dosage of ferrum redactum and of iron and ammonium citrate is higher in patients with achlorhydria than in those with normal gastric secretions.[3 19 30 35 39 47] The most intractable examples of anæmia occur in patients in whom the gastric secretion has been reduced and the hæmopoietic area of the stomach and duodenum has been side-tracked by gastrectomy or gastro-enterostomy. These cases seem to depend not so much on anacidity—in many of them the secretion of acid persists in spite of operation—as on a hurried passage through the jejunum, and they are associated with severe general impairment of the digestive powers and consequent modifications of the diet.[16] In fatty diarrhœa also the action of iron is much diminished.

Potentiation and Antagonisation of Iron

The therapeutic action of iron can be enhanced by certain procedures which facilitate the absorption or the utilisation of iron. Bethell and co-workers showed that a dosage of 300 mg. a day of ferrum redactum was ineffective when given in three divided doses of 100 mg. but was effective when given in ten divided doses of 30 mg.; this seems to be a pure absorption phenomenon. In experimental animals iron can be absorbed and stored in the liver but cannot be converted into hæmoglobin unless copper is also present[37]; this is apparently a pure utilisation phenomenon. It is difficult to demonstrate the action of copper in man, in whom deficiency of copper is excessively rare. Pyrrole derivatives such as bile pigment,[34] chlorophyll, and the cytochrome of yeast[32 33] potentiate the action of iron, probably by facilitating its conversion into hæmoglobin. Other examples of potentiation are more complex. The beneficial effect of the simultaneous ingestion of acid, in the form of hydrochloric acid or of buffered acid media,[27] is most simply demonstrated in patients with achlorhydria, in whom the acid acts by replacing the gastric secretion and facilitating absorption, but there is also evidence to suggest that iron is conserved in the body by an acid diet and that its excretion is increased by an alkaline diet.[36] The potentiating action of liver is highly complex, as liver is an acid food and a source of additional iron, copper, and pyrrol derivatives.[31] Calcium is said to have an iron-sparing action,[40 42 45] by which one must suppose promotion of absorption is meant, but the evidence is scanty, and in experiments on animals the reverse effect has been observed, rats becoming extremely anæmic on a high calcium diet.[41] Apart from this last observation, which is of doubtful human application, the only example of antagonism to iron I have met is Lintzel's statement that citric, tartaric, lactic, and similar acids diminish the absorption of iron, on which account he believes that large amounts of fruit, such as apples, oranges, and lemons, should be forbidden in anæmia. The potentiation of iron must always be borne in mind in experiments designed to estimate the effective dosage of preparations. It is of little immediate therapeutic importance, as these adjuvant actions can only be demonstrated when suboptimal amounts of iron are given, and with rare exceptions hypochromic anæmia in man can always be repaired by massive doses of iron. On the other hand, the potentiation of iron is of the utmost importance to nutrition, because foods rich in available iron, such as meat and eggs, are costly, and diets should therefore be designed to ensure the utmost utilisation of the iron they contain. This is a direction in which we may look forward to further acquisitions of knowledge.

Dosage of Different Preparations of Iron

So far I have spoken of the therapeutic action of iron without making distinctions, but I hope to show that the various preparations of iron differ in therapeutic efficiency just as much as one star differs from another in brightness. One of our chief preoccupations in the study of anæmia has been the determination of the most suitable preparations of iron to be prescribed and the optimum dosage. It will be apparent from what has already been said that the assessment of the therapeutic action of iron requires carefully controlled conditions. Man is the most suitable animal for such experiments, not merely because of his large size or the facility with which his blood may be examined and his excreta collected, nor because his benefit is our ultimate goal. Indeed a study of the literature suggests that governments are more interested in preventing iron deficiency in their domestic animals than in their human populations. But man is peculiarly liable to suffer from a pure

and uncomplicated iron deficiency which can be completely corrected by the administration of inorganic salts of iron. In this country work on nutritional anæmia of infancy and idiopathic hypochromic anæmia was considerably influenced by McGowan's observations on iron deficiency in sucking-pigs and sheep. With this notable exception work on animals has rarely been capable of immediate transfer to man. The original denial of the value of inorganic salts of iron; the subsequent equalisation of all inorganic salts of iron; the recommendation of whole liver and secondary liver extract in hypochromic anæmia; the emphasis on the action of copper—none of these has been directly applicable to man.

Iron is administered internally in medicine for its hæmatinic action and for its tonic or roborant action. My further remarks will be confined to its action in anæmia, though the presence of iron in every living cell suggests that its use in debility and in disease of the central nervous system is not without a theoretical basis. In the anæmias which respond to iron the red cells are paler and usually smaller than normal. Certain anæmias of this type, when left untreated, may persist almost unchanged for years. They respond dramatically to iron and are therefore an ideal subject for experiment. The most important examples are idiopathic hypochromic anæmia, with which I include chlorosis, and the anæmia of hookworm disease. Certain chronic hæmorrhagic anæmias may also exhaust the ability to improve spontaneously and be suitable test-objects provided further hæmorrhage can be excluded. The criteria on which we select patients for experiment on the action of iron are as follows:—

1. The anæmia should be one of the torpid and hypochromic anæmias which I have mentioned.

2. Patients who have suffered from hæmorrhage or have recently been treated are unsuitable unless an adequate control period has shown no tendency to improve.

3. Infection, toxæmia, malignant disease, pregnancy, old age, and damage to vital organs such as the liver, the kidneys, and the thyroid, all impair the response to iron and render the case unsuitable.

4. The initial hæmoglobin level should not exceed 50 per cent., or else the reticulocyte response will be too small to be utilised and the hæmoglobin gain will not be comparable with that of the severer grades of anæmia.

5. The state of the gastric secretion should be known. Achlorhydria should not exclude the patient and is in fact an advantage, as anæmia is so often complicated by achlorhydria. Short-circuiting operations and severe functional disturbances of the alimentary tract such as steatorrhœa render the patient unsuitable.

6. The diet and mode of life should be constant throughout the period of observation.

In the pharmacopœia of the future the dosage of drugs will doubtless be given per kilogramme of body-weight and by mathematical formulæ or diagrams which express individual variations in therapeutic, toxic, and lethal reaction. At present there is neither the knowledge to compile nor the ability to use such a formulary, but it is well to remember that the customary method of stating doses gives little indication of the infinite variety of mankind in its response to medication. Some women with simple achlorhydric anæmia improve rapidly on as little as 15 grains of iron and ammonium citrate a day, others may need 150 grains. I shall therefore speak only of the average effective dose. The "single reticulocyte crisis" is not very helpful in determining average effective doses of preparations of iron, as the reticulocytoses in hypochromic anæmia are of a lower order and less constant than those of pernicious anæmia.[29 30] I will refer to the use of the "double reticulocyte response" later. Most use has been made of the "rate of hæmoglobin increase." The curve representing the rise of hæmoglobin during treatment has a sigmoid shape, there being an initial lag, a subsequent steady rise, and a final slowing in the rate of hæmoglobin regeneration as the normal level is approached. The maximum effect of treatment occurs between the second and fourth weeks, and the increase of hæmoglobin should therefore be estimated over a period of not less than 25 and not more than 40 days from the initiation of treatment.[15] It has been found by experience that the rate of hæmoglobin regeneration in man rarely exceeds 2 per cent. a day. The "average effective dose" of a preparation of iron may be defined as the dose which produces an average increase of over 1 per cent. of hæmoglobin a day in a sufficiently large sample of patients with achlorhydria and anæmia, when the initial hæmoglobin level does not exceed 50 per cent., and when the period of observation is not less than 25 and not more than 40 days. The analyses of Heath and Fullerton show that about 60 per cent. of such a series of patients will gain more and 40 per cent. will gain less than 1 per cent. of hæmoglobin a day, but the mode of the series will be just over 1 per cent. In the accompanying Table I have summarised from my own experience and from the literature the average effective daily dose of the common preparations of iron.

TABLE *showing average effective dose of common preparations of iron, and percentage of iron administered utilised for hæmoglobin formation.*

Preparation.	Daily dose in grammes or c.cm.	Iron content in mg.	Utilisation (per cent.).
Metallic—			
Ferrum redactum [2 23 29]	1·5 to 6·0	1200 to 5000	0·5 to 2·0
Ferrous—			
Ferrous chloride [20 25]	0·25 to 0·5	100 to 200	12·5 to 25
Ferrous sulphate exsic.[13]	0·6	180	14
Ferrous lactate [20] ..	1·5	300	8
Pil. ferri carb. (Blaud) [20 21 47]	3·0 to 4·0	300 to 400	6 to 8
Ferric—			
Liq. ferri perchlor. ..	8·0	400	6
Ferric citrate [23] ..	2·0	400	6
Idozan (ferric hydrox.)[28]	30 to 45	1500 to 2250	1·1 to 1·7
Soluble ferric oxide [25]	35	1000	2·5
Complex ferric—			
Fe et ammon. cit.[2 19 47]	4·0 to 8·0	800 to 1600	1·5 to 3·0
Injection—			
Inj. Fe B.P.[6 20] ..	5·0 to 10·0	16 to 32	100

Organic.—As already indicated, only the non-hæmoglobin-like part of the iron of the food is available, and hæmoglobin and similar compounds do not exert the therapeutic action of iron.

It is obvious that iron is most active when given by injection, but in practice parenteral administration is contra-indicated by its dangers. The therapeutic dose of iron by injection (iron and ammonium citrate equivalent to 32 mg. iron) is so close to the toxic dose (48–80 mg. iron) that effective treatment can hardly be given by this route.[6 20] I have seen toxic symptoms from the injection of 14 mg. of iron a day in the form of iron and ammonium citrate, which is far less than the effective dose. When iron is given by mouth symptoms of general intoxication, as distinct from intestinal irritation, are most unusual, and in spite of the frequent prescription of enormous doses, only one example of severe intoxication from ingested iron is on record.[21] The amounts of iron which patients have taken with impunity are very large—150 grains a day of reduced iron [29]; 150 grains of Blaud's pill a day for two or three months [38]; 300 grains of iron and ammonium citrate daily [47]; and while higher dosage than necessary is unwise

there is no excuse for giving too little. The most important lessons from recent work on iron are the futility of injecting iron and the safety of large doses by mouth.

The therapeutic activity of preparations of iron by mouth is directly proportional to their solubility and to the ease with which they yield free ions of ferrous iron. Metallic iron, colloidal ferric preparations, and the scale preparations, in which the iron is in a complex form and not readily ionised, all require to be given in large doses to produce effects. The soluble ferrous salts are the most active. The average effective dose of ferric chloride has not yet been worked out with any degree of accuracy, but from some uncompleted experiments by N. S. Plummer and myself it must be higher than 400 mg. of iron a day, equivalent to liq. ferri perchlor. minims 40 t.d.s. We have obtained incontrovertible evidence that ferric chloride is less potent than ferrous chloride or ferrous sulphate by the method of the double reticulocyte crisis. In these experiments, after a control period, we have treated the patient for a short time with the equivalent of 200 mg. of iron a day as ferric chloride, and have afterwards given the same amount of iron as ferrous chloride or ferrous sulphate. The higher potency of the ferrous salts is revealed by the occurrence of a second reticulocyte crisis and by an acceleration in the rate of hæmoglobin formation. Similar results have been reported by Reimann and Fritsch. On the other hand it is clear that ferric salts are effective if given in sufficient amounts. Their relative inferiority cannot be explained by precipitation on contact with food residues, as colloidal ferric preparations are less effective than the astringent preparations. It is possible that iron is not absorbed in the ferric valency, and that ferric salts are reduced to the ferrous state in the alimentary tract before absorption; on this account they are less potent than the preformed ferrous preparations (Fig. 2).

The most active preparation of iron is not necessarily the most suitable for prescription, and the choice of a preparation for medicinal use is governed by a number of additional factors such as price, palatability, tolerability, durability, and ease of prescription. The soluble simple salts of iron are all irritating to the stomach. The ferrous salts tend to oxidise in solution, though this may be inhibited by avoiding over-dilution and making up the mixture with glucose and/or acid; if they are given in solid form they may cause vomiting, whilst tablets become hard and insoluble unless carefully and freshly prepared. The solution of ferric chloride is intensely irritating, and I found it quite impossible to use it in effective doses till I learnt the device of adding it to milk immediately before taking.[14] The massive amounts of iron which must be ingested when reduced iron, colloidal ferric iron, or the scale preparations are used, may cause indigestion, diarrhœa, cramps, and constipation,[19] and even intestinal obstruction.[42] There is also evidence that large amounts of unabsorbed iron in the intestine may interfere with the absorption of other minerals [5 46] and vitamins.[4] The ideal preparation of iron still awaits discovery, but the following are some useful and cheap prescriptions :—

Ferrous chloride (Howard)	3 grs.
Syrup	15 minims
Chloroform water .. .. to	1 drachm
e lacte, t.d.s., p.c.	
Pil. ferri. carb.	15 grs.
t.d.s., p.c. To be crushed before taking.	
Iron and ammon. citrate	30 grs.
Glycerin	15 minims
Chloroform water .. .. to	1 oz.
t.d.s., p.c.	

Among proprietary preparations, which are sometimes more highly esteemed by patients on account of their elegance and costliness, one may mention Ferronyl (ferrous chloride), Oppenheimer's Bipalatinoids (ferrous carbonate), and Idozan (ferric hydroxide).

In the Table I have estimated the percentage of the dose of iron administered which is utilised in the manufacture of hæmoglobin when there is an increase of 1 per cent. a day, using the following calculation [15] :

Blood iron corresponding to 100 per cent. hæmoglobin = 50 mg. per 100 c.cm.
Blood volume = 5 litres.
Thus a rise of 1 per cent. hæmoglobin is equivalent to a gain of $50/100 \times 50 = 25$ mg. of iron as hæmoglobin.

The utilisation of an average effective dose of ferrous iron is approximately 20 per cent., and if minimum effective doses of ferrous iron are prescribed, between 50 and 100 per cent. of the dose ingested may be utilised for hæmoglobin formation. Reticulocyte crises and repair of anæmia may be observed with a daily dosage as low as 22 mg. of ferrous iron by mouth. The massive dosage of some preparations of iron has led to a good deal of misunderstanding of the mode of action of the metal, but there now seems no doubt that the effective dosage of preparations of iron is directly proportional to the ease with which they yield free ferrous ions. The effective dose of soluble ferrous salts is small and of the same order as the iron contained in the food. The action of iron on the blood-forming organs can be simply explained as the provision of a raw material for the manufacture of hæmoglobin. The administration of iron also relieves the soreness of the tongue and the fissuring at the corners of the mouth, the dystrophy of the nails, the atrophy of the skin, and the bruising and menorrhagia, which often accompany hypochromic anæmia and are probably due to lack of iron in the

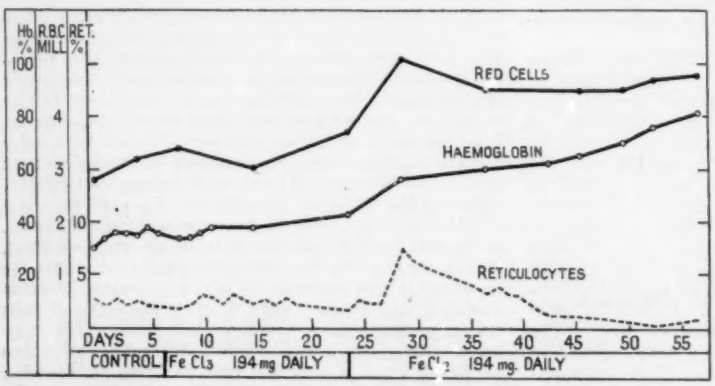

FIG. 2.—Superiority of bivalent ferrous over trivalent ferric chloride when given in doses containing equal amounts of the metal.

tissues. Excess of iron has no influence on hæmopoiesis in health, nor does iron provoke blood formation in the same way as oxygen-want, arsenic, or X rays, so that we are probably correct in assuming that iron is a nutrient and not a stimulant for the blood-forming organs.

To a large extent iron is used to repair deficiencies which would not have occurred had the diet been satisfactory, and as the hygiene and nutrition of the world improve, we may expect conditions such as the "physiological" anæmia of pregnancy, the nutritional anæmia of infancy, and the anæmia of hookworm infestation to follow chlorosis into the limbo of vanished diseases. But the value of diet in anæmia is essentially prophylactic, and when the iron supplies of the organism are exhausted it is hard to replenish them in a reasonable time from the food. We can foretell no decrease in those forms of anæmia which cannot be prevented by diet alone, such as idiopathic hypochromic anæmia and pernicious anæmia, in which the absorption of iron is impaired, and splenic anæmia and chronic hæmorrhagic anæmia, in which excessive amounts of iron are lost. The metal iron is sacred to the god of war, but even in that distant day when swords are beaten into ploughshares, and the peoples of the world are fed not with bread alone, but with diets adequate in biological proteins, vitamins, and minerals, the physician must preserve his skill in the therapeutic use of iron.

Summary

(1) The factors which affect the requirement, the absorption, and the utilisation of iron are discussed.

(2) The absorption of the iron contained in food or drugs is proportional to the ease with which ferrous ions are liberated.

(3) Iron acts as a nutrient and not as a stimulant for the blood-forming organs.

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GASTRIC ACIDITY AND ITS SIGNIFICANCE

A CLINICAL AND EXPERIMENTAL STUDY

BY FRANK L. APPERLY, M.D. Oxon., D.Sc. Melb.

PROFESSOR OF PATHOLOGY IN THE MEDICAL COLLEGE OF VIRGINIA, RICHMOND, VA., U.S.A.

THE literature relating to variations in gastric acidity, and their significance, is vast and conflicting. Standards of normal acidity for healthy people, and for different sexes and ages, have been set up, although every degree of acidity and even achlorhydria are found in perfectly healthy individuals. In this paper an attempt is made to bring together various experimental and clinical facts into a correlated whole, so that we may better understand not only how gastric acid is regulated and variations are produced, but the significance of these changes, and their bearing on general bodily conditions.

The concentration of hydrochloric acid in pure gastric juice has been given different values by many observers. The recent and most careful work of Hollander and Cowgill [1] however shows that the pure parietal juice has an acid concentration of 0·170 N (pH 0·91), a figure which is independent of rate of secretion or type of stimulus. Variations in acidity are brought about by admixture with mucus and solutions of sodium chloride and bicarbonate, secreted by the gastric mucosa and in some cases regurgitated from the duodenum.

We are, however, more concerned here with variations in acidity at various times after a standard meal irrespective of the mechanism by which these changes are brought about.

THE RELATION OF ACIDITY TO BLOOD CO_2

In 1931 Apperly and Crabtree [2] showed that variations in the CO_2-content of the fasting blood plasma not only governed the *acidity* of the gastric contents after a test-meal in any one individual, but were also responsible for the differences in gastric acidity between different individuals (Fig. 1). In 1932 Browne and Vineberg [3] confirmed these results in

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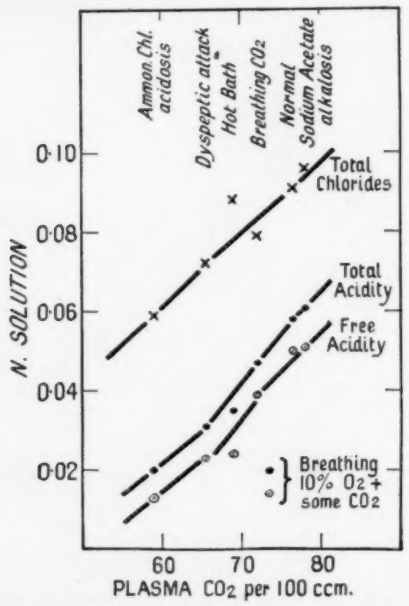

FIG. 1.—Relationship of (*a*) total chloride, total acidity, and free HCl of gastric contents one hour after the commencement of a test-meal, to (*b*) the CO_2 capacity of the fasting blood-plasma in one individual under various conditions of acidosis, alkalosis, &c. (from Jour. of Physiol.[5]).

dogs and further showed that the *total amount* of acid secreted could be increased or diminished by artificially raising or lowering plasma CO_2.

But what are the factors responsible for variations in plasma CO_2? Does clinical experience show that such variations result in similar variations in gastric acidity? Obviously, of course, the respiratory centre is the immediate regulatory mechanism. But other causes underlie this. Let us therefore correlate what is known about gastric acidity with the conditions in which plasma CO_2 is known to be increased or diminished, and thus possibly obtain some idea as to the significance of these gastric variations. These conditions can be classified thus:—

(*a*) Primary CO_2 deficit, commonly associated with some rise of blood pH.
(*b*) CO_2 deficit, secondary to loss of blood alkali, associated with fall of pH.
(*c*) Primary CO_2 excess, associated with fall of pH.
(*d*) CO_2 excess, secondary to rise of blood alkali, associated with rise of pH.

(*a*) *Primary CO_2 deficit* is brought about by pulmonary hyperventilation from any cause (except that following respiration of a high CO_2 atmosphere), as for instance by heat, fevers, the earlier stages of oxygen shortage, altitudes, encephalitis, and certain cardiac diseases. The fall of plasma CO_2 following hyperventilation has been shown by Haggard and Henderson,[4] Collip and Backus,[5] and Grant and Goldman[6]; that following confinement in a hot room by Cajori[7]; in a hot bath by Bazett,[8] Koehler,[9] and Landis[10]; and in the tropics by Sundstroem,[11] Radsma et al.,[12] and others. The lowering of gastric acidity under each of these conditions has been demonstrated respectively by Delhougne[13] and Browne and Vineberg[3]; by Talbert and Rosenberg[14]; by Apperly and Semmens[15]; and by Nye and Sippe.[16]

Apperly[17] was the first to apply the above facts as a possible explanation of the diminished incidence of peptic ulcer in warmer climates when compared with the incidence in people of similar habits in cooler climates. In a survey of the Australian States he showed that peptic ulcer was commonest in Tasmania (latitude 43° 0′ S) with an incidence of 135 per 1000 hospital beds per year, and that the figures for the various States gradually diminished, as the Equator was approached, to a minimum of about 28 in tropical North Queensland (latitude 21° 10′ S). Later Nye and Sippe[16] showed an increased incidence of achlorhydria and hypochlorhydria in Queensland as compared with the cooler southern States, and in summer as compared with winter. This survey is interesting because in Australia we have, spread over a huge area extending from the tropics to mild and even cold zones, an almost pure Anglo-Saxon race with almost exactly similar dietetic and other habits. When we compare different races with different diets of course this relationship to heat and cold no longer holds—e.g., among the cayenne pepper-eating Abyssinians, and the people of Southern India with their highly spiced foods, it is not surprising to find that the incidence of gastric ulcer is unusually high (Bergsma,[18] Bradfield[19]).

A further interesting fact is the hypochlorhydria and achlorhydria of fevers whether of natural origin (Glaessner[20]) or experimentally produced by vaccines (Vanzant[21]), but it is probable that toxic and other factors than the fall of plasma CO_2 consequent on the hyperventilation of pyrexia (Koehler,[9] Hachen and Isaacs[22]) are operating in these cases.

While the effects of X radiation are still open to some doubt, there is considerable evidence that such treatment results in a fall of plasma CO_2 and a rise in pH (Hussey,[23] Kast et al.,[24] Myers and Booher[25]), i.e., changes similar to those following hyperpnœa; but we have no direct evidence of the effects of the above on gastric acidity and motility. It is, however, of interest to note that X radiation reduces hyper-

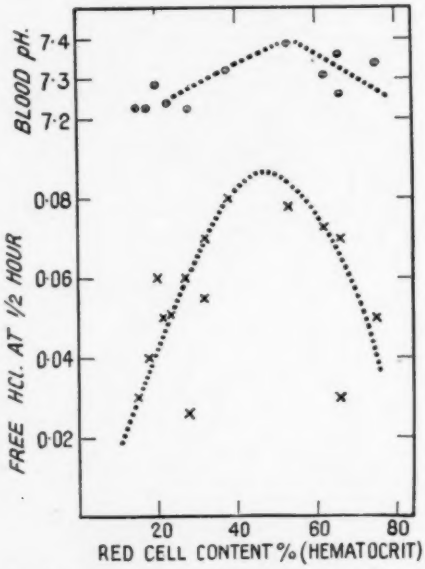

FIG. 2.—Relationship of gastric acidity after a 5 per cent. alcohol "meal" in dogs to red cell content of blood.

acidity, and increases intestinal motility even to diarrhœa (Pohle [26]).

(*b*) *Fall of plasma CO_2 secondary to a primary alkali deficit* usually follows loss or neutralisation of plasma alkali by exogenous or endogenous acids.

The simplest case is that in which the ingestion of sufficient ammonium chloride lowers both plasma CO_2 (Haldane,[27] Gamble et al.,[28] Apperly and Semmens [15]) and gastric acidity, with a prolongation of gastric emptying-time (Apperly and Crabtree [2]). Clinically, the same phenomena are exhibited in the diminished gastric acidity in the later stages of pregnancy (Nakai,[29] Davies and Shelly [30]) in which there is a fall of plasma CO_2 due to alkali deficit (Bock,[31] MacNider,[32] Rowe et all.,[33] and others); by the fall of gastric acidity after severe exercise (Hellebrandt and Miles [34]) in which lactic acid causes a fall in blood CO_2 (Bock and Dill,[35] Boje,[36] and others); by the generally lowered acidity in those of poor physical fitness (Bloomfield and Keefer [37]) in whom there is also usually a lowered plasma CO_2 (Osman and Close [38]); and by the hypochlorhydria and anacidity of chronic nephritis (Jones,[39] Friedenwald and Morrison [40]) in which plasma bicarbonate is so commonly diminished (Henderson, Bock et al.,[41] and many others).

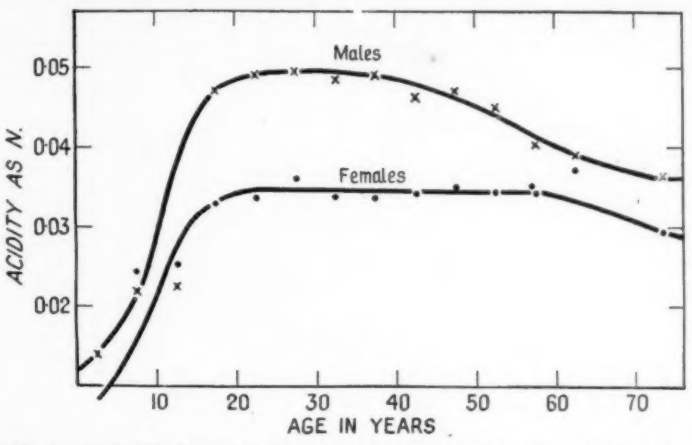

FIG. 3.—Variations of average normal gastric acidity with age and sex (after Alvarez, Vanzant et al.[15]).

As regards the effects of diabetic acidosis, several text-books state that achlorhydria and hypochlorhydria are commonly found, but I am unable to find any statistics corrected for age and sex to compare with the figures for normal people. It is interesting, however, that insulin increases the secretion of gastric acid (Roholm,[42] Collazo and Dobreff [43]), the acidity after a test-meal (de Anciaes [44]), and gastric motility (Dickson and Wilson [45]).

Of the effects on gastric acidity of starvation and the diarrhœal disease, in both of which plasma bicarbonate is diminished,[79 80] there appears to be no definite evidence; immediately after starvation there appears to be some diminution of total acid secretion in dogs (Kunde [46]) but in man Carlson [47] could find no such changes.

It is somewhat difficult to place the various anoxæmias in the classification here used. In all cases hyperventilation leads to diminished plasma CO_2, as in hæmorrhage (Bennett,[48] Buell [49]), at altitudes (Barcroft,[50] Wittkower,[51] Fitzgerald [52]), and after breathing a low-oxygen atmosphere (Koehler,[53] Haggard and Henderson [4]). Whereas, however, in the early stages the loss of CO_2 directly follows hyperventilation with rise of blood pH—which would tempt us to classify this group under Class (*a*)—in the later stages lactic acid formation neutralises part of the plasma alkali, with a fall of pH. Most of the cases here discussed fall into the latter group which is therefore classed under (*b*). In each of the cases mentioned above a lowered gastric acidity has been demonstrated—e.g., at altitudes by Delrue in the case of dogs [71]—and by Apperly, Crabtree, and Norris for man (unpublished); after breathing an oxygen-poor atmosphere (Crisler, Van Liere, and Wiles,[54] Apperly and Crabtree, unpublished); and in some of our own observations following hæmorrhage in both dogs and man. In most of the above instances the stomach emptying-time was retarded.

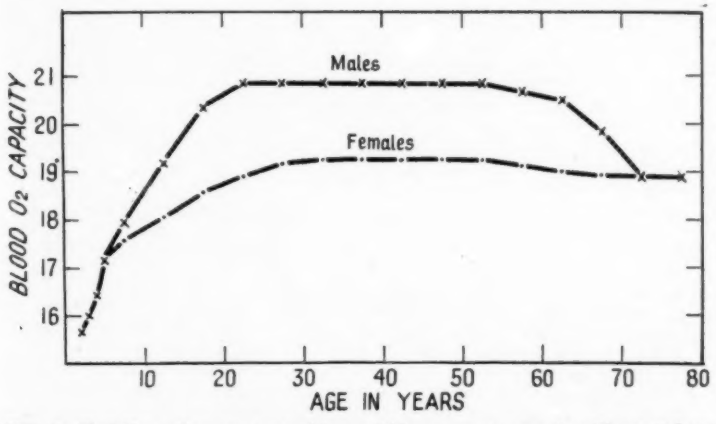

FIG. 4.—Variations of average normal hæmoglobin or oxygen capacity with age and sex (modified from Peters and Van Slyke [66]).

Fig. 2 shows the results in one of our series of experiments on dogs, in which anæmia and polycythæmia were artificially produced by bleeding and transfusion.[91] It will be seen that gastric acidity rose with red cell content up to a maximum at or slightly above the normal content. (Beyond this, with increasing polycythæmia, acidity fell again. The reasons for this will be dealt with elsewhere.) Similar figures were found in normal and anæmic patients. Not only do we have acidity changes with the grosser forms of anoxæmia, but also corresponding to those variations of hæmoglobin which are within normal limits.

Without going into our

experimental work here, we will merely mention the most interesting and striking similarity between the graph representing the average gastric acidities for different age- and sex-groups (as determined by Vanzant, Alvarez et al. from 3746 cases,[55] Fig. 3) and the graph showing the average hæmoglobin content of the blood for similar age- and sex-groups (from Peters and Van Slyke,[56] Fig. 4). Further, when the figures in these two graphs are plotted against each other, a straight line relationship is revealed (Fig. 5). We have of course found a considerable individual scattering about these average curves. These charts suggest two things: (1) that variations in average gastric acidity for different age- and sex-groups are at least

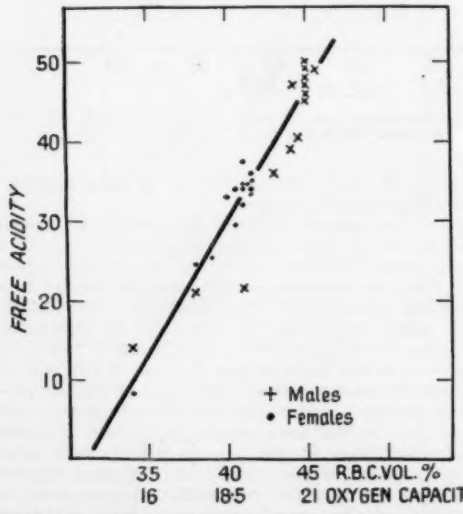

FIG. 5.—Relationship of average gastric acidity of different age and sex groups (taken from Fig. 3) to average hæmoglobin for the same groups (taken from Fig. 4).

partly dependent on hæmoglobin differences, or whatever causes the latter; and (2) that, assuming the straight line in Fig. 5 continues as such to the base-line, gastric acidity disappears when the hæmoglobin content of the blood falls to about two-thirds its normal value—i.e., that anæmia can bring about achlorhydria. We have indeed found this in patients with post-hæmorrhagic anæmia. This observation is of great interest in view of the well-known work of Witts and others on the reverse relationship—i.e., that certain anæmias are preceded and caused by achlorhydria. It would appear that we will have to distinguish between Witts's achlorhydric anæmia and our anæmic achlorhydria. We hope to publish these and other observations in the near future.

Dr. Alvarez has suggested to me that the changes in acidity and motility may explain the fact that the symptoms of peptic ulcer often improve after a severe hæmorrhage.

(*c*) *Primary CO_2 excess* in the plasma is brought about either by breathing an atmosphere containing an excess of CO_2 gas (Davies et al. [57]), or by any process that interferes with the elimination of CO_2 from the blood—e.g., in emphysema (Scott,[58] Dautrebande,[59] Peters et al. [60]), or during an asthmatic attack (Osman and Close,[38] Apperly and Norris (unpublished)). Bakaltschuk [61] and Apperly and Crabtree [2] showed the rise in acidity brought about by breathing an atmosphere containing 3–5 per cent. CO_2 or by rebreathing one's own CO_2. Johnston and Washeim [62] showed the same result during sleep, when plasma CO_2 rises, possibly on account of a diminished sensitiveness of the respiratory centre, resulting in CO_2 retention (Endres [63]).

R. J. Main, in this laboratory, has shown a close linear relationship between alveolar CO_2 per cent. and the ratio of pulmonary vital capacity to body surface (unpublished)—i.e., that healthy large-lunged individuals have a higher alveolar CO_2. Full and Herxheimer [64] have also found a decidedly higher average alkali reserve in athletes than in untrained men. This high blood alkali or CO_2 in normal people indicates an optimum oxygenation (Gesell [65]). It is therefore not surprising that the big-chested, athletic type of man has, on the whole, a higher gastric acidity than the opposite physical type (Campbell and Conybeare,[66] Vogeler [67]). Apperly and Semmens [15] demonstrated a rough correlation between gastric acidity and the ratio of pulmonary vital capacity to body-weight.

Another cause of increased plasma CO_2 is constriction of the bronchioles. We have found this in a number of asthmatics during an attack, but of the effect on gastric acidity of bronchiolar constriction brought about, for example, by asthma, noxious gases, and possibly by smoking with inhalation, we know nothing. The hyperchlorhydria of many smokers is generally attributed to the direct effect of swallowed irritants on the gastric mucosa. Possibly an increased bronchiolar constriction, reflex or direct irritation, might be a factor.

(*d*) *Increased plasma CO_2 secondary to primary alkali excess* has been demonstrated experimentally after the ingestion of large doses of sodium acetate and other alkaline salts by Davies and Haldane,[57] Palmer et al.,[6] Gesell and Hertzman,[69] and others, and clinically during a course of Sippy's diet (Kast,[24] Myers and Booher [25]). That gastric acidity is raised under the same conditions has also been shown by Apperly and Crabtree [2] and by Hardt and Rivers [70] respectively. The former also observed an increased gastric motility.

The accompanying Table is a summary of the above observations.

RELATION OF GASTRIC ACIDITY TO BLOOD pH

In the Table Groups (*a*) and (*b*) are associated with diminished plasma CO_2 and (*c*) and (*d*) with increased plasma CO_2. On the other hand, those conditions in which pH is increased are found in Groups (*a*) and (*d*), while (*b*) and (*c*) contain those associated with a fall of pH. It will be seen that gastric acidity follows variations in CO_2, but has no relationship to blood pH.

RELATION OF GASTRIC MOTILITY TO BLOOD pH

Although few observations have been made on the relation of gastric motility to blood chemistry, the evidence presented above and summarised in the Table shows that experimental and clinical variations of the plasma CO_2 associated with increased gastric motility fall in Groups (*a*) and (*d*), while those associated with a retarded emptying rate fall in Groups (*b*) and (*c*). This seems to indicate that blood pH is a factor in determining gastric motility, these two varying in the same direction.

Table showing Relation of Gastric Acidity and Emptying-time to Blood Bicarbonate and pH

Figures denote references

(*a*) PRIMARY CO_2 DEFICIT

—	Plasma CO_2	Blood pH.	Gastric acidity.	Gastric motility
	Dim.	Inc.	Dim.	Inc.
Hyperpnœa	4, 5, 6	4, 5, 6	3, 13	..
Hot room	7	7	14	..
Hot baths	8, 9, 10	10	15	15
Tropics	11, 12	12	16	..
Fevers	9, 22	9	20, 21	..
Altitudes	50, 51, 52	50	71, 72	..
Encephalitis	73, 74	73	..	..
X radiation	23, 24, 25	23, 24, 25	..	26
Some cardiac failures without pulm. comp.	75, 76	..	..	..

(*b*) PRIMARY ALKALI DEFICIT

—	Dim.	Dim.	Dim.	Dim.
Ingestion of amm. chloride or HCl	27, 28, 77, 2	28, 77	2, 3	2
Chronic nephritis	41 et al.	41	39, 40	..
Diabetes	78, 25	78, 25	Tk.	..
Severe exercise	35, 36, 74	35, 74	34	34
Menstruation	38	..	83	..
Pregnancy	31, 32, 33	No pH changes reported.	29, 30	..
Anoxæmia chronic	53, 4	53, 4, 81	54, 72	54, 72
Hæmorrhage severe	48, 49	48, 82	Fig. 2.	91
Poor physical fitness	38, 64, 15	..	37	15
Starvation	79	79	46	..
Infantile diarrhœa	80	80	..	..
Some cardiac failures near death	75	75	..	..

Tk. = Text-book statement.

(*c*) PRIMARY CO_2 EXCESS*

—	Inc.	Dim.	Inc.	Dim.
Breathing CO_2	57	84, 85	2, 3, 61	2
Sleep	63	..	62	62
Large $\frac{\text{V.C.}}{\text{W.}}$ † or $\frac{\text{V.C.}}{\text{S.}}$	86‡	87	15, 66	67, 15
Emphysema	58, 59, 60	59	..	..
Asthmatic attacks	38, 72	..	..	..
Certain cardiac failures with CO_2 retention	75, 88	75, 88	..	..

* This group is often complicated by anoxæmia, hence may overlap Group (*b*). † See text. ‡ Alveolar CO_2.

(*d*) PRIMARY ALKALI EXCESS

—	Inc.	Inc.	Inc.	Inc.
Ingestion of alkaline salts	57, 68, 69, 2	57, 69	2, 3, 89, 90	2
Sippy diet	24, 25	24, 25	2, 70	..
Insulin following diabetic acidosis	..	..	42, 43, 44	45

Dim. = diminished. Inc. = increased.
Pulm. comp. = pulmonary complications.

PRACTICAL CONSIDERATIONS

The preceding suggest some possible practical applications:—

1. Hyperchlorhydria and the symptoms associated with it might be diminished by, among other things, (i) removal to a warm climate, (ii) artificial fever, (iii) heat treatment, (iv) bleeding, and (v) the substitution of oxides and non-absorbable bicarbonates for the usual sodium bicarbonate treatment, since the latter salt in large amount, by increasing plasma CO_2, may actually raise gastric acidity.

2. Certain of the hypo-acid dyspepsias are more likely to be influenced by attention to the underlying anoxæmia or acidosis than by direct local treatment. A search for the causes of a low plasma CO_2 may be fruitful, since it may give a clue to the underlying pathological conditions.

3. In dealing with cases in which achlorhydria or hypochlorhydria is associated with anæmia, it might be well to investigate which of these conditions is primary—i.e., whether we are dealing with an anæmic achlorhydria or an achlorhydric anæmia (Witts).

SUMMARY

Gastric acidity after a meal is chiefly a function of the blood CO_2. In normal people this is regulated by the hæmoglobin content of the blood, by the ratio of the pulmonary vital capacity to body-weight (or surface), and by temperature. Under abnormal conditions anoxæmia, anæmia, altitudes, pregnancy, nephritis, fevers, diabetes, severe exercise, and lowered physical fitness may diminish plasma CO_2 and therefore gastric acidity. Asthma, emphysema, &c., which raise plasma CO_2, would be expected to raise gastric acidity, while encephalitis, X radiation, and certain cardiac conditions, which lower plasma CO_2, would be expected to lower gastric acidity; but these effects have not been investigated. The acidity of the gastric juice is a rough measure of the alkali reserve of the blood (except in marked anæmia), while the rate of gastric evacuation would seem to be influenced partly, at least, by blood pH. A consideration of the possible causes of such variations of plasma CO_2 and pH may give valuable hints as to the pathological conditions underlying certain dyspepsias.

There is also a direct relationship between the red cell content of the blood and gastric acidity. When the former falls to about half or two-thirds normal (on the average) free acid disappears from the stomach. A distinction is therefore made between the achlorhydric anæmia of Witts and anæmic achlorhydria.

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THE INHIBITORY EFFECT OF FOLLICULAR HORMONE

ON THE ANTERIOR LOBE OF THE PITUITARY GLAND

BY BERNHARD ZONDEK, M.D.

PROFESSOR IN THE HEBREW UNIVERSITY OF JERUSALEM

(*From the Gynæcological and Obstetrical Department of the Hadassah-Rothschild Hospital, Jerusalem*)

IN previous papers I have been able to determine the following facts. The anterior pituitary is the motor of sexual function. The gonadotropic hormones of the anterior pituitary represent the superior sexual hormones. The anterior lobe stimulates the secretion of (*a*) folliculin (œstrin) in the theca cells by means of prolan A (follicle-stimulating hormone), and (*b*) progestin, in the granulosa cells by means of prolan B (luteinising hormone). Without the anterior lobe there is no folliculin. The follicular hormone, produced in the ovary through the action of the follicle-stimulating hormone (prolan A), reacts in its turn upon the anterior lobe.

The present paper is a preliminary report of experiments in which I have studied the inhibitory effect of the follicular hormone given over long periods in amounts much larger than those ordinarily produced in the body—given, that is to say, as a drug. Elsewhere I shall report the effect of these large doses of follicular hormone on its effector organ, the uterus, and I now propose to describe their effect on the controlling gland, the anterior pituitary.

My first finding is that the hormonic function of the anterior pituitary can be inhibited.

INHIBITION OF THE GROWTH HORMONE

The experiments were performed on rats. Infantile rats, 3–4 weeks old, weighing 25 g., received subcutaneous injections of follicular hormone twice a week. These injections consisted of either α-hormone in aqueous or oily solution, or the benzoic ester of the dihydrofollicular hormone (Dimenformon).* The control animals received injections of normal saline or olive oil. In doses of 100 M.U. (mouse units) twice a week folliculin had no effect on body growth. After four months' treatment, with a total amount of 2900 M.U., the treated animals were of the same size and weight as the controls. On the other hand, when 1000 M.U. was applied twice a week, definite inhibition of growth was seen in 4½ weeks (after a total of 9000 M.U.). The larger the amount of hormone, the greater the inhibition of growth. The effect is very obvious if 5000 or 10,000 M.U. dimenformon is applied twice a week. A slackening of growth is apparent within a short time, though it only becomes really definite when the animals have reached the juvenile stage and weigh 70 g. While the weight curve steadily rises in the control animals, the curve of those which have been treated remains constant or rises very little. After 3–4 months' treatment—e.g., after the application of 100,000–200,000 M.U.—a difference in weight amounting to as much as 43 per cent. may be shown. For instance, the control animals weigh 164 g., and the treated animals 96·5 g.

If the experiments are performed on juvenile animals with a weight of 70 g., their growth may

* I am indebted to the Organon (Oss) for kindly supplying large amounts of Folliculin Menformon and Dimenformon.

similarly be inhibited. The application of 5000 M.U. folliculin twice a week produces inhibition after three weeks (total 30,000 M.U.), and if continued for 3–4 months (120,000–160,000 M.U.) leads to a difference in weight amounting to 20 per cent. The earlier the experiments are begun—i.e., the younger the animals—the more striking is the inhibition of growth. It is seen equally in male and female animals.

The relation between growth inhibition and the dose of hormone is shown in the accompanying Table. The inhibition affects the skeleton as well as the organs. The treated animals are shorter, and

Table showing Growth Inhibition resulting from Follicular Hormone

(A) INFANTILE ANIMALS

Sex.	Preparation.	Dose.	Duration of treatment in weeks.	Total amount Foll.-Menf. in m.u.	Growth inhibition shown by reduction of weight, per cent.
F.	Foll.-Menf. aqu. sol. (α-hormone).	100 m.u. twice a week.	16	2900	0
M.	Foll.-Menf. aqu. sol.	1000 m.u. twice a week.	5½	12,000	9·6
F.	,,	500 m.u. twice a week.	12½	13,500	11·1
M.	Dimenformon.	5000 m.u. twice a week.	5½	60,000	32·7
M.	,,	10,000 m.u. twice a week.	5½	120,000	31·7
F.	,,	5000 m.u. twice a week.	15	130,000	30
F.	,,	Initial injection of 15,000 m.u., then 5000 m.u. twice a week.	12½	145,000	23
M.	,,		12½	145,000	43·3
F.	,,	Initial injection of 15,000 m.u., then 10,000 m.u. twice a week.	12½*	225,000	30·7
F.	,,		12½	275,000	39

(B) JUVENILE ANIMALS

F.	Foll.-Menf. oily sol.	5000 m.u. twice a week.	15½	155,000	26.3
F.	Foll.-Menf. aqu. sol.	,,	17½	190,000	23·5

* No treatment from 8/8 to 21/8.
Foll.-Menf. = Folliculin-Menformon.
aqu. sol. = aqueous solution.
oily sol. = oily solution.

the bones are more delicate. As an example I report the differences in weight of one of the experiments.

Control animal.—The femur weighs 0·35 g., tibia and fibula 0·31 g.

Folliculin animal (R 117) (five months' treatment with a total of 205,000 M.U.).—The femur weighs 0·29 g., tibia and fibula 0·24 g.—i.e., a difference in weight of 17 and 22 per cent. respectively.

The anatomical changes in the epiphyseal lines will be reported in a separate communication.

Mention may further be made of changes in the fur of animals under treatment. The hair is rough and shaggy, and shows a tendency to fall out, particularly in the gluteal region.

The experiments demonstrate the possibility of inhibiting growth by prolonged application of large amounts of follicular hormone. The younger the animal, the more intense the inhibition. The retardation is particularly conspicuous during the puberty of the rats—i.e., at a weight of about 70 g. H. M. Evans and Long were able to demonstrate that the growth of rats can be increased by injection of anterior pituitary extracts. My experiments show, conversely, that large doses of follicular hormone may destroy the effect of the growth hormone of the anterior pituitary. Evans and Long produced giant animals by means of growth hormone, while I produce dwarf animals by means of follicular hormone. The fact that the inhibition of growth results from the paralysis of the growth hormone caused by the follicular hormone becomes evident when we find that the gonadotropic hormones which are produced in the anterior lobe may equally be inhibited.

INHIBITION OF THE GONADOTROPIC HORMONES

The sexual organs of the animals whose growth has been inhibited by follicular hormone show definite changes. Prolonged application of the hormone induces a continuous œstrus, with the result that vaginal smears regularly show cornified cells. The vagina is thickened and hyperplastic, and the mucous membrane proliferates. The uterus also shows much enlargement, and the myometrium is in the stage of pronounced proliferation. These enlarged genital organs contrast remarkably with pale and small ovaries, which may undergo so great an involution that they are no longer recognisable as such. While abundant corpora lutea are to be found in the control animals, they are absent in the ovaries of the treated animals. In serial sections small follicles are usually to be found, also some follicles of average size, but rarely large follicles, and never corpora lutea. This difference clearly manifests itself in reduction in the weight of the ovaries. When the application of follicular hormone was started in the juvenile stage (the animals weighing 70 g.), administration of 165,000 M.U. during 16 weeks caused a reduction of, e.g., 20 per cent. in body-weight and 58 per cent. in the weight of the ovaries. The ovaries of the control animals weighed 37 mg., those of the treated animals 15 mg.

The development of the ovaries is retarded by the prolonged application of follicular hormone; the follicles do not rupture, and corpora lutea are not formed. This effect undoubtedly originates in the following fashion: follicular hormone paralyses the gonadotropic hormones of the anterior pituitary—and, as it appears, the luteinising hormone, prolan B, in particular—thus hindering them from exerting their normal influence on the ovaries.

The same reaction is to be observed in the male. It has long been known that folliculin has an anti-masculine effect, and that the testes diminish in size when it is administered. The way in which this happens has not hitherto been explained, but my experiments demonstrate that it is due to inhibition of those hormones of the anterior pituitary which stimulate testicular development. In the experiments previously described by other workers and by myself, relatively small doses of folliculin were used; but I am now able to show that if male rats are given doses sufficient to arrest their body growth tremendous changes in the testes are produced. This may be illustrated by the following example.

Male rat, 4 weeks old, and weighing 30 g., received one injection of 15,000 M.U. dimenformon, followed by regular application of 5000 M.U. twice a week. After three months' treatment, with the total dose of 155,000 M.U., the animal

weighs 94 g., while the control animal weighs 160 g.† —a difference of 41 per cent. In the control animal the weight of the mature testis was 1000 mg., but in the treated animal only 50 mg.—a difference of 95 per cent. The testes of the treated animal remained at the infantile stage seen in animals two weeks old.

The development of the genital apparatus (testis, spermatogenesis, prostate, and seminal vesicles) is completely arrested by prolonged application of folliculin.

In a further report I hope to describe the effects of large doses of folliculin on the thyrotropic hormone and other hormonotropic active principles, as well as the changes in the anterior lobe of the hypophysis of the treated animals. The importance of these results in clinical work will be discussed later.

INTRAVENOUS CURARINE IN THE TREATMENT OF TETANUS

By Ranyard West, M.D., M.R.C.P. Lond.

BEIT MEMORIAL RESEARCH FELLOW; DEMONSTRATOR OF PHARMACOLOGY IN THE UNIVERSITY OF OXFORD; ASSISTANT PHYSICIAN TO THE SEAMEN'S HOSPITAL, GREENWICH

Curarine is the commonest active principle of curare. It is responsible for the characteristic action of the curares of British Guiana and its presence in these is constantly due to the bark of a ligneous vine, *Strychnos toxifera*, which is a chief ingredient of the native mixture.

Curarine is a quaternary alkaloid which can be prepared in crystalline form either from suitable curare or direct from *S. toxifera*. It is the latter source which has enabled the alkaloid to be prepared in quantity recently (King, 1935).

The action of curarine is the classical one of curare—a paralysis of muscle from a failure of the effective transmission of the impulses travelling to it along the motor nerve. Death from curarine is due to asphyxia following failure of the respiratory muscles. But the paralysing action of curarine is not necessarily sudden, complete, and universal; it is graded quantitatively and has a selective anatomical distribution. Experimentally, in animals, small doses cause a failure of *maintenance* of contraction (response to electrical tetanus) while the response to single stimuli remains good. Recently curarine has been found to act selectively on certain rates and strengths of electrical stimuli (Briscoe, 1935). Further, the pathological conditions of decerebrate rigidity in the cat and of experimental local tetanus have been found by Bremer (1927) to respond selectively to curare, and, in the case of decerebrate rigidity, to curarine (1935). Anatomically, the order of sensitivity of muscles is strikingly constant, viz.: (1) muscles receiving a cranial nerve-supply; (2) the skeletal muscles generally, including the intercostal muscles; and (3) the diaphragm.

Curare has been introduced into therapeutics and abandoned on many occasions since the middle of last century. The irregular strengths and compositions of curares would make their standardisation very difficult. Curarine was isolated from curare by Preyer (1864) and tried therapeutically by Hoffmann (1879). It was prepared from *S. toxifera* by Boehm and given to a case of tetanus by Hoche (1894), (Hale-White, 1901). Recent partial successes in treating chronic pathological rigidities with some crude curares (Hartridge and West, 1931; West, 1932) has led to a collection of plant material and a resurvey of the pharmacology of curarine (West, 1935). Meanwhile Cole (1934) and Mitchell (1935) have reported cases of acute tetanus treated with curare and with curarine respectively. Florey, Harding, and Fildes (1934) gave curarine to animals in experimental tetanus.

In our animal experimentation it was noticed that, in the cat, a clear removal of decerebrate rigidity without failure of respiration could be maintained only by giving the drug very slowly. The intravenous route was found much safer than the subcutaneous in that by it partial recovery will occur within a few minutes of stopping the inflow of the drug. A tendency to bronchial spasm and hypersecretion was met by atropine or adrenaline, for rapid action the latter being preferable. This intravenous technique was transferred to man and tried in a volunteer suffering from advanced parkinsonism. The method finally adopted, and here described, forms a provisional suggestion for the treatment of severe cases of tetanus.

Method of Treatment

The *apparatus* used is the following:—

1. An intravenous drip outfit, with duplication of reservoir and dripper. The dripper must be calibrated. The Canny-Ryall or Farquharson dripper commonly delivers from 500 to 700 drops per ounce of fluid. The vein may be entered either by needle or cannula.
2. A malleable gutter splint to fix the arm in a comfortable position.
3. Artificial respiration equipment: endotracheal catheter—e.g., St. Bartholomew's type (grey), small, medium, or large. Two oxygen cylinders, with good fine adjustments on the taps; glass junctions for tubing.
4. Direct-vision laryngoscope.
5. Mason's gag, tongue forceps, mounted swabs (as anæsthetist's tray).
6. Adrenaline solution 1 : 1000.
7. Curarine chloride in solution, 100 mg. of the solid to a pint of saline or glucose saline.

Dose.—The standard rate of curarine inflow may be taken as 0·25 mg. per kg. of body-weight per hour. The rate of drip required to deliver this may be calculated as follows:—

$$\text{Drops per minute} = \frac{0{\cdot}25 \times \text{wt. of patient (kg.)} \times \text{drops per oz. from dripper} \times 20}{\text{mg. curarine per pint saline} \times 60.}$$

If the curarine is made up at a strength of 100 mg. to the pint, the patient's weight is 70 kg., and the dripper is found to deliver 600 mg. per oz., this becomes—

$$\text{Drops per minute} = \frac{0{\cdot}25 \times 70 \times 600 \times 20}{100 \times 60} = 35$$

A pint of solution lasts about six hours.

Technique.—An initial dose of atropine (gr. 1/50) is given subcutaneously, and ten minutes later an intravenous needle is strapped in position in a suitable vein on an arm which is splinted so as to flex the elbow at some 30°. (The fully extended arm was found a very painful posture.) A can of warmed glucose saline with a visible drip attachment is connected, and curarine added to the solution so as to deliver 0·25 mg. per kg. per hour to the patient. It is convenient if it is arranged so that this is equivalent to about 30 drops per minute in the dripper. A second can of warmed normal glucose saline connected to the intravenous system near the patient's arm is a valuable means of securing fluid and food to the patient and of preventing clotting in the

† The control animals received olive oil subcutaneously twice a week in the same amounts as were used for the oily solution of dimenformon in the treated animals.

needle or vein whenever the curarine-saline has to be turned off.

At first the curarine-saline is run in at six times its "maintenance rate"—e.g., 3 drops per second—so that 0·25 mg. per kg. is delivered in about ten minutes. This should be sufficient for curarisation, and during the administration the patient is closely watched, and, if well enough, interrogated about his sensations.

Curarisation.—A muscular weakness in the distribution of the cranial nerves is to be expected as the sign of partial curarisation. The patient may complain that his head is heavy, that his tongue will not move, or of diplopia. Ptosis is usually the first objective sign of curarisation, but weakness of other motor cranial nerves may be noted early. At the first sign of curarisation it is wise to halve the rate of inflow. But, speaking from my present limited experience, I would designate as the best sign of effective curarisation a change in the breathing. A nurse will record the breathing as "shallow." Actually intercostal respiration almost or quite ceases, abdominal (diaphragmatic) respiration continuing steadily and without effort. The change is often sudden and indicates that curarisation has gone as far as it can be taken unless respiratory failure is to be courted deliberately.

On completion of the induction of curarisation, the inflow is stopped for about five minutes and then restarted at the maintenance level of 0·25 mg. per kg. per hour. For the first hour its effects should be watched closely, as the rate may be too high and lead to an actual shallowness or a visible effort in abdominal breathing, or too low, with resultant return of intercostal breathing or an increase of the pathological rigidity.

In a case of tetanus with persistent tonic rigidity of jaw, neck, and abdomen, there should be marked, if not complete, relaxation of these muscles when curarisation has occurred to the level indicated. With an ordinary sized dripper (e.g., the Canny-Ryall) a pint of curarine-saline, dripping at a rate of 30 drops per minute, may be expected to last about six and a half hours. Animal experiments suggest that atropine (gr. 1/100 to 1/50) should be given subcutaneously every four hours, if bronchial spasm and hypersecretion are to be avoided. Should they occur, adrenaline is probably a better immediate remedy.

It is not yet possible to say how long treatment by curarine drip can be maintained in tetanus. In Case 2 (below) it was continued for 20 hours without difficulty, other than from (avoidable) clotting in the needle.

Sleep remains an important desideratum. I think a small nightly dose of morphine may be given safely, and the treatment is not incompatible with *light* Avertin anæsthesia (0·05 c.cm. per kg.). The patient to whom this was given slept well and yet lightly for three hours. Weakness of the muscles of deglutition may cause difficulties and accidents in swallowing, and if these occur a feeding-tube should be passed early and kept in position as along as is necessary.

If dangerous spasms occur they are likely to be respiratory in type, and particularly bronchial. These may be due to the tetanus. But pure curarine is itself capable of causing bronchial and laryngeal spasm in animals, and the history of one patient (Case 13) shows this to be a real danger of curarine in man. So sudden may the onset of the spasm be, that, even when it is watched for and the requisite apparatus is immediately to hand, it may be difficult to deal with. An intermittent closure of the glottis occurs, and an endotracheal catheter has to be passed during the first possible moment of relaxation if the patient's airway is to be secured. I have used the St. Bartholomew's type (grey) intratracheal catheter in one emergency of this kind, and found it satisfactory. A rapid stream of oxygen should be delivered through the catheter. Consciousness is lost very early; the catheter should be retained until there are signs of its return, and only removed then if spontaneous breathing is active.

In critical cases of tetanus adequate relaxation may be incompatible with the retention of spontaneous respiration. Curarisation may then be deliberately deepened, and a means of artificial respiration provided. The Bragg-Paul Pulsator (Messrs. Siebe Gorman and Co.) can be used. But in view of the risk of bronchial spasm it is essential to be able, in addition, to deliver oxygen directly to the lungs by the endotracheal catheter. For, in animals under severe curarine spasm, it is impossible to perform effective artificial respiration by a compression method.

Ten Cases of Tetanus

The accompanying Table summarises 10 cases of tetanus treated during 1935. They illustrate the observation that when the incubation period is under seven days or the period of development of symptoms to the point of generalised convulsions less than three days, death must be expected whatever the treatment adopted. Cases 1, 2, 3, 4, 8, 9, and 10 fall into this category, and though their treatments were various, all the patients died. Of these 7 cases it will be noted that, in 5, death occurred not later than the day after the onset of general convulsions. The exceptions are Cases 2 and 10. The former was given intravenous curarine, the latter avertin in repeated doses. Case 10 was exceptional in the very long incubation period of 19 days being followed a day later by generalised convulsions. On the twenty-second day of his illness the patient, a man of 63, appeared to be improving. Acute hyperpyrexia occurred, with cardiac failure, on the twenty-third day. The case treated with curarine (No. 2) is described below.

Of the three cases in which the outcome was reasonably in doubt (Nos. 5, 6, 7) two had an incubation period of seven days, and one of these recovered. Cole (1934) recorded the treatment of such a patient with curare and his subsequent recovery. This patient (No. 5) was a boy of 13. He received no curare and no special treatment beyond repeated antitetanic serum and a chloral and bromide mixture.

CASES TREATED WITH CURARINE

CASE 2 was extremely severe. The incubation period was five days and the generalised convulsions occurred on the following day. On admission, 60,000 units of antitetanic serum had been given. Paraldehyde grs. 60 and bromide grs. 40 had been given repeatedly. I saw the patient early on the seventh day. There was a high degree of tonic spasm of the jaw, neck, and abdominal muscles.

Treatment.—After atropine gr. 1/50, curarine 12 mg. was given intravenously, taking seven minutes over the injection. Complete ocular ptosis resulted, with partial relaxation of the muscles of the jaw, neck, and abdomen. Curarine is rapidly excreted, and much of the rigidity returned within 30 minutes. When full rigidity had returned, 10 mg. of curarine in 10 c.cm. of solution was injected intravenously during four minutes. Full relaxation of the trismus occurred, the patient supporting his fallen jaw in his hand. Relaxation of the neck and abdominal muscles followed. Fifteen minutes later, and

Table of Cases of Tetanus, 1935

Case and age.	Incubation and development. Probable site of infection.	Incubation and development. (a) Onset. (b) Convulsions. Day.	Treatment. Serum and period. Units.	Treatment. General and special.	Outcome.
1 (9)	Splinter in foot.	(a) 5th (b) 6th	490,000	Sedatives.	Fatal spasm on 2nd day of symptoms, 7th day.
2 (27)	Nail in foot.	(a) 5th (b) 6th	200,000 3 days.	Curarine intravenously 20 hours. Avertin 0·05 c.cm. per kg. once.	8th day. Resp. spasm and asphyxia.
3 (c. 50)	?	(a) 5th (b) 7th	120,000 2 days.	Avertin 0·05 c.cm. per kg. 2-hourly.	8th day convulsions ceased: hypostatic pneumonia.
4 (9)	Splinter in leg.	(a) (b) 7th	—	—	Death under light chloroform ether anæsthesia, for diagnostic lumbar puncture.
5 (13)	—	(a) 7th (b) 10th	24,000 2 days, 365,000 8 days.	Chloral grs. 10, bromide grs. 15, 4-hourly.	3 convulsions on 10th day. 11th day improving. 34th day recovered.
6 (32)	Nail in foot.	(a) 7th (b) 11th	192,000 2 days.	Curarine intravenously.	12th day. Resp. spasm, cardiac failure.
7 (24)	Cut hand.	(a) 10th (b) 14th	150,000	Curarine subcutaneously.	15th day. Fatal resp. spasm following feeding.
8 (51)	Infected finger.	(a) ? 11th (b) ? 12th	200,000 at once.	Avertin 0·1 c.cm. per kg. 6-hourly (reduced).	13th day. Generalised fatal spasm.
9 (38)	Nail in foot.	(a) 13th (b) 15th	120,000 2 days.	Chloral and bromides.	16th day. Fatal spasm (the second).
10 (63)	Compound fracture tibia.	(a) 19th (b) 20th	200,000 3 days.	Avertin 0·05 c.cm. per kg. 4-hourly.	23rd day. Hyperpyrexia and sudden cardiac failure.

during full relaxation, 10 mg. curarine was given subcutaneously. Curarine takes 20–30 minutes to be absorbed from the subcutaneous tissues. Good relaxation was obtained for 2 hours. After 4½ hours full tonic rigidity had returned and small added spasms had commenced at 5-minute intervals. After atropine gr. 1/50, curarine 9 mg. in 9 c.cm. in 4½ minutes was given intravenously. Rigidity was removed but began to return in 35 minutes. Thereupon the curarine intravenous drip was started.

Induction of relaxation was obtained by giving 7·5 mg. in 7 minutes. A lower rate of inflow was then adopted, and 66 mg. was given in each 6-hourly period for 18 hours. During this period the patient remained almost flaccid, slept and was fed. He received two injections of morphine gr. ¼, and during the treatment sleep was assisted by one-half dose (0·05 c.cm. per kg.) of avertin rectally. After 18 hours of treatment, difficulty from clotting in the needle caused the return of rigidity, a rapid deterioration in the patient's condition, and the onset of attacks of respiratory spasm. Curarine was restarted as a continuous subcutaneous injection, but it was found impossible to maintain a constant rate of inflow. Further respiratory spasms were difficult to control owing to the difficulty of introducing endotracheal catheters. The patient's own respiration was probably weakened by the curarine, and the strain of right-sided cardiac congestion and anoxæmia caused a comparatively sudden cardiac failure.

The outcome of this case was a disappointment. For it was felt that a patient who had been successfully treated for two days after the onset of violent tetanic spasms might have survived if further time could have been given for the progressive removal of his toxæmia.

CASE 6.—The onset of symptoms was on the seventh day, and although generalised spasms did not occur until the eleventh, the case then became critical. A generalised convulsion had occurred during the early morning. During the day the patient was free of spasms, but in the evening they returned and by midnight they were prolonged and severe. The technique described was followed and an intravenous drip established at a rate of 0·27 mg. per kg. per hour. Considerable relaxation was obtained and the patient continued to breathe spontaneously without difficulty. After 3 hours of curarisation spasms involving the bronchial muscles occurred. Four such spasms occurred within an hour and necessitated the passage of the endotracheal catheter. The patient was considerably cyanosed before the catheter could be introduced, and his general condition had deteriorated. After the institution of endotracheal oxygenation there was no further cyanosis, but larger concentrations of curarine (0·4 mg. per kg. per hour) had to be given to maintain flaccidity. Six hours after the commencement of curarisation, and 2 hours after the passage of the catheter, the pulse-rate had risen and there were already signs of pulmonary congestion. The jaw remained relaxed, the neck muscles largely relaxed, the abdominal muscles partly so. The limbs were flaccid, the patellar reflexes which are abolished only in deep curarisation were generally but not always obtainable. It was decided not to stop the curarine inflow, in view of the inevitable return of muscular spasm. But from the time of the last respiratory spasm the patient's condition became worse until death from cardiac failure 2½ hours later.

CASE 7.—In this case the incubation period was ten days, and a further four days elapsed before the onset of generalised spasm. The patient was first seen after these had become very severe. Rapid respiration, tachycardia, and high fever were present. Each spasm arrested respiration for about a minute, and each was expected to end fatally. Curarine 2·5 mg. was given subcutaneously when the case was seen. An hour later the patient was fed through a tube and immediately suffered a long respiratory spasm. Curarine 7·5 mg. was then given subcutaneously and oxygen continuously by a short nasal tube. Relaxation occurred 30 minutes subsequently, but the patient never recovered consciousness after the previous respiratory spasm and died an hour later.

Death from generalised spasm involving respiration is one of the common ends in cases of tetanus. But in animals curarine had itself shown a tendency to cause respiratory spasms (West, 1935). In decerebrate cats these spasms can be prevented by atropine and removed by adrenaline. The means of their production is not clear, for though an isolated strip of the tracheal muscle of the cat will contract under the influence of curarine, it does so uncertainly and only with the drug in high concentration (1 : 1700). Such contractions of the isolated tracheal muscle are relaxed by adrenaline (1 : 125,000), but not by atropine.

Control Observations

In order to ascertain the therapeutic effect of curarine on the rigidity of post-encephalitic parkinsonism, three advanced cases were treated with the drug by the intravenous route.

CASE 11.—After the effects of ascending doses had been tried, the first patient received 0·25 mg. per kg. in 10 c.cm. of solution during 11 minutes by intravenous injection. Blurred vision and slight headache occurred, but there was no loss of rigidity or of tremor, both of which were marked features of the case. The result confirmed previous observations with curarine given subcutaneously (West, 1935). No respiratory symptoms developed.

CASE 12.—The second patient received intravenous curarine by the drip method; an induction with 0·1 mg. per kg. in 5 minutes (1·2 mg. per kg. per hour) resulting in a temporary reduction of rigidity. The rate of inflow was halved after 5 minutes and continued at about 0·6 mg. per kg. per hour for 10 minutes. Severe ptosis developed, the pathological rigidity relaxed, probably with some loss of power, and respiration became purely abdominal. The curarine inflow was then stopped, but restarted 10 minutes later. Rigidity returned very quickly after cessation of the curarine inflow. No laryngeal spasm occurred. The case shows that, even with the best conditions—a dripping inflow giving a gradual and controlled rise of concentration in the blood stream—the power of removing rigidity is transitory and the margin between the effective and the asphyxial concentrations small.

CASE 13.—The third patient was very rigid, with a good deal of added tremor. A preliminary injection of atropine gr. 1/50 was given; the patient having already considerable tolerance to drugs of this series. Curarine induction occupied 20 minutes and was continued until the arms were relaxed, the tremor being somewhat diminished. The flow was then interrupted for 5 minutes, after which stiffness was again increasing. Curarisation was continued at about 0·8 mg. per hour until ptosis developed (3 minutes), the patient felt unable to raise the arm (5 minutes), and breathing became "light"—i.e., abdominal (10 minutes). Parkinsonian rigidity was virtually abolished, and tremor remained nowhere but in the lips. This level of curarisation was maintained for 15 minutes at a rate of 0·2 mg. per kg. per hour, when the inflow was stopped. An hour later the patient had had a meal and the rigidity had largely returned. Curarisation was now induced more rapidly, at over 3 mg. per kg. per hour. Relaxation and "light" breathing occurred after 8 minutes and the inflow was stopped. Immediately subsequently the patient pointed to her throat, choked, and was apparently unable to breathe further. The condition closely resembled what has been described in animals under curarine (loc. cit.). An electric laryngoscope was instantly inserted into the mouth, and the endotracheal catheter passed, with some difficulty, owing to a spasm of the false vocal cords. A stream of oxygen was blown through the catheter, which was not removed for nearly half an hour, when its presence appeared to embarrass the patient. After the catheter had been passed, adrenaline and later strychnine were given hypodermically. The patient was able to talk 50 minutes after the onset of the spasm. She recollected no events between its commencement and the manipulation of an airway after the removal of the oxygen catheter. Sore-throat and some bronchial catarrh developed on the following day, but the patient was able to get up on the third day. She declared her rigidity to be less then than previously, but if this were so it did not remain so.

The alarming experience of this "control" case demonstrates the reality of the danger of curarine respiratory spasm.

Conclusions

(1) Curarine treatment of tetanus should still be reserved for cases which are already very severe or in which by the accepted criteria (Cole, 1935) the prognosis is very grave. I have not yet had experience of a case of tetanus which showed its first symptom less than seven days after infection, and which subsequently recovered. Cole (1935) records one such case, with recovery under antitoxin and general treatment only. But cases occurring on the seventh day have recovered with and without curare.

(2) If curarine be given in severe tetanus, the intravenous drip is probably the most effective method of its administration.

(3) A real danger of curarine treatment—bronchial spasm—is shown by the experience with a "control" case of advanced parkinsonism (Case 13). The spasm can be effectively treated by prompt endotracheal intubation only. Probably the risk of it is increased if the induction of curarisation is hastened beyond the rate of 1·5 mg. per kg. per hour (or 0·25 mg. per kg. in ten minutes). Animal experiments justify the administration of atropine gr. 1/100–1/50 hypodermically before and at four-hour intervals during the period of curarisation, and of a full dose of adrenaline (1 c.cm. liquor adrenalini hydrochlor.)* if the spasm occurs.

(4) Curarine in its present available form is unsuitable for the treatment of cases of chronic rigidity.

(5) Curarine is given to cases of tetanus only as a means of removing muscular spasm. It may be combined with other methods of treatment, particularly with *light* avertin narcosis. Needless to say antitoxin is required as urgently as with any other treatment. At present I would give 200,000 units when the diagnosis is made. This is the recommendation of Cole in his recent full review of the treatment of tetanus (1935). In the early and acute cases, if the patient can be kept alive for two days, the giving of more serum should be considered. I should like to endorse Cole's plea for early diagnosis: "Stiffness of the jaw, especially if accompanied by pain in the back or abdomen, probably means tetanus."

Summary

(1) The administration of curarine by continuous intravenous drip is described.

(2) Ten cases of tetanus are recorded, nine of which proved fatal. Treatment varied (see Table).

(3) In two fatal cases curarine was given intravenously, and in one of them death was delayed beyond the expected point. Respiratory spasm followed an inability to maintain an even curarisation after 18 hours of successful treatment.

(4) The treatment of three cases of advanced parkinsonism by the administration of curarine intravenously is recorded. The absence of an adequate margin between the rigidity-removing ("lissive") dose and that affecting respiration, together with the transitory action of curarine, renders it, in its present available form, unsuitable for the treatment of these chronic conditions.

(5) Experience with one case of parkinsonism under curarine treatment establishes bronchial spasm as a serious danger of curarine therapy in man.

(6) It is suggested that the best method of giving curarine which is at present available is by intravenous drip. This method can be controlled from minute to minute, if necessary, and enables the narrow margin between the beneficial "lissive" action and the asphyxial action on respiration to be increased. It is further suggested that the only present place for intravenous curarine in therapeutics is its continued experimental use in cases of tetanus in which, by the accepted standards (Cole, 1935), recovery cannot be expected by other means.

I am indebted to the following for permitting me to see cases of tetanus under their charge: Mr. P. H. Mitchiner, Dr. R. Harvey-Williams, Dr. W. M. Robson, Dr. Maurice Shaw, Dr. Leslie Cole, Dr. R. Grainger, and the medical superintendents of Kingston Municipal Hospital, Croydon Municipal Hospital, and West Park Mental Hospital, Epsom. I received both help with cases and suggestions for improving technique from: Dr. Maurice

* Recent animal experiments showing a spasmodic action of curarine on isolated tracheal and bronchial muscle to be immediately antagonised by adrenaline suggest that this drug should be given very slowly by the *intravenous* route until relaxation occurs.

Shaw (who suggested the intravenous route), Mr. J. Lindahl Dr. R. Woolmer, and A. Kennedy.

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A MERCURIAL (NOVURIT) SUPPOSITORY AS A DIURETIC FOR CARDIAC ŒDEMA

BY JOHN PARKINSON, M.D., F.R.C.P. Lond.

PHYSICIAN IN CHARGE OF THE CARDIAC DEPARTMENT OF THE LONDON HOSPITAL; AND

WILLIAM A. R. THOMSON, M.D. Edin.

PATERSON RESEARCH SCHOLAR AND CHIEF ASSISTANT IN THE DEPARTMENT

ORIGINALLY introduced by Zieler [14] as a remedy for syphilis in 1917, Novasurol was first used as a mercurial diuretic for dropsy by Saxl and Heilig [13] in 1920. Satisfactory as a diuretic, it proved to have the disadvantage in some patients of causing a severe diarrhœa and other toxic effects. By means of chemical modifications, Salyrgan was synthesised in 1923, and it is now clear that as a diuretic it is as potent as novasurol, and that its toxicity is negligible. A similar though not identical product known as Neptal was subsequently produced in France, and it also proved efficacious in the treatment of dropsy

These preparations have the disadvantage of having to be administered intravenously or intramuscularly, preferably by the former route. Sloughing may result from leakage into the subcutaneous tissues, and the patient have to submit to an exceedingly painful arm for the subsequent 24–48 hours. This should seldom occur, and it can be obviated with fair certainty and with little additional trouble by diluting the contents of the phial to 10 c.cm. with sterile water or saline as recommended by Bedford.[1] Attempts have been made to administer salyrgan by mouth, but with little success. Thus Fleckseder [6] gave it in daily doses with ammonium chloride over a period of several weeks with a meagre result. Engel and Epstein [5] refer to rectal administration of salyrgan in 100 c.cm. water, with moderately good results.

Herrmann and his colleagues [7] suggested that a combination of the organic mercurial diuretics and the purine bases produced a larger diuresis than either separately. Such a combination is found in a preparation with the trade name of Novurit which has been tested and found satisfactory by many workers including Popper,[11] Crawford and McDaniel,[3] and DeGraff, Nadler, and Batterman.[4] Novurit is a sodium salt of trimethylcyclopentandicarboxylic acid allylamidmethoxymercurichydroxide combined with theophyllin. It may be given intravenously or intramuscularly in doses of 1–2 c.cm., each c.cm. containing 0·10 g. of the mercurial salt and 0·05 g. of theophyllin.

Recently the same drug has been prepared in the form of a suppository which contains 0·5 g. of novurit in cocoa butter. Though rectal administration of a drug often has clear disadvantages compared with oral administration, an effective suppository would be a simpler method in private practice than an intravenous injection. It would be an advance in the therapeutics of congestive heart failure to be able to administer a mercurial diuretic simply and safely by this route. This paper records our short experience of the clinical action of novurit suppositories. We have been assisted throughout by Dr. Basil S. Grant to whom we are indebted.

METHODS

The problem of controls in a clinical investigation is always difficult. To take alternate patients and give to one the suppository, and to the next an intravenous mercurial diuretic the action of which is already known, has the disadvantage that no two cases of cardiac dropsy are alike. The alternative, and the method used by us, is to administer different drugs to the same patient. Of course, one disadvantage of this method is that the drug first administered is more likely to produce a diuresis than one given later when the œdema is already diminishing; but on the whole we feel that it is the better method.

Twelve consecutive cases have been so treated, all being cases of congestive heart failure with œdema, although in some the œdema was slight. Two of them are excluded from this report: one died with hemiplegia and coma a few days after admission for heart failure; the other was excluded because he had received regular doses of digitalis, and we wished to test only those free from all medication other than the diuretics under discussion. Brief summaries of the ten consecutive cases utilised for this study are as follows:—

CASE 1.—Female, aged 23. Mitral stenosis. Aortic incompetence. Normal rhythm. Failure. Two years, dyspnœa. Eight weeks, palpitation and swelling of abdomen. Three days, swelling of ankles.

On admission: Cyanosis, dyspnœa, œdema of feet and lumbar region, ascites, enlarged liver, right hydrothorax. Pulse-rate 100. Electrocardiogram, sinus tachycardia. Urine, trace of albumin. Weight 7 st. 3½ lb. (46·1 kg.).

On discharge: No evidence of œdema or hydrothorax, liver not palpable. Weight 5 st. 8½ lb. (35·7 kg.).

CASE 2.—Male, aged 60. Angina pectoris. Normal rhythm. Failure. Eight years, angina of effort. Two months, dyspnœa. Two weeks, swelling of ankles.

On admission: Dyspnœa, liver slightly enlarged. Pulse-rate 100. Blood pressure 120/95. Radioscopy, small right hydrothorax. Urine, trace of albumin.

On discharge: No evidence of œdema or hydrothorax, liver not palpable.

CASE 3.—Male, aged 59. Auricular fibrillation. Failure. One year, increasing dyspnœa, palpitation. Two weeks, swelling of ankles. Three days, jaundice.

On admission: Orthopnœa, cyanosis, jaundice. Marked œdema of ankles and lumbar region. Pulse-rate 104. Electrocardiogram, auricular fibrillation. Radioscopy, no hydrothorax. Urine, trace of albumin. Weight 9 st. 5½ lb. (59·8 kg.).

On discharge: No evidence of œdema. Weight 8 st. 4½ lb. (53·0 kg.).

CASE 4.—Female, aged 66. Hypertension. Auricular fibrillation. Failure. Several years, increasing dyspnœa. Two weeks, persistent dyspnœa and œdema of feet.

On admission: Orthopnœa, cyanosis, œdema of feet, legs, and lumbar region. Liver enlarged. Pulse-rate 90. Electrocardiogram, auricular fibrillation. Radioscopy, right hydrothorax. Urine, trace of albumin. Weight 11 st. 10½ lb. (74·8 kg.).

Response to diuretics was slow. Died in hospital three

weeks after admission. Weight (4 days before death) 10 st. 4 lb. (65·5 kg.).

CASE 5.—Male, aged 68. Hypertension. Normal rhythm. Bronchitis and emphysema. Failure. One year, dyspnœa and œdema. Six months ago, in-patient with heart failure.

On admission: Orthopnœa, gross anasarca, ascites, bilateral hydrothorax. Pulse-rate 104. Electrocardiogram, normal rhythm. Blood pressure 170/110. Urine, cloud of albumin.

On discharge: No evidence of œdema or enlargement of liver. Loss of weight, 3 st. 8 lb. (22·7 kg.) (see Chart).

CASE 6.—Male, aged 25. Mitral stenosis. Aortic incompetence. Auricular fibrillation. Failure: In-patient on three occasions during preceding year on account of failure. Three weeks, swelling of abdomen. One week, increasing dyspnœa.

On admission: Afebrile, dyspnœa, anasarca, ascites, liver enlarged. Pulse-rate 90. Electrocardiogram, auricular fibrillation. Blood pressure 140/90 approximately. Radioscopy, no hydrothorax. Urine, trace of albumin. Weight 10 st. 10½ lb. (68·4 kg.).

On discharge: No œdema. Liver not palpable. Weight 8 st. 8½ lb. (54·8 kg.).

CASE 7.—Male, aged 58. Chronic bronchitis. Angina pectoris. Normal rhythm. Failure. Ten years, "winter cough." Two months, angina pectoris, palpitation, and dyspnœa.

On admission: No orthopnœa, slight œdema of ankles. Pulse-rate 96. Electrocardiogram, normal rhythm. Blood pressure 170/80. Radioscopy, small left hydrothorax. Urine, no albumin. Weight 12 st. 11 lb. (81·4 kg.).

On discharge: No œdema or hydrothorax. Weight 11 st. 4 lb. (71·8 kg.).

CASE 8.—Female, aged 53. Chronic bronchitis. Normal rhythm. Failure. Four years, dyspnœa and œdema of ankles. "Winter cough" for many years.

On admission: Dyspnœa, slight œdema of legs. Pulse-rate 76, normal rhythm. Blood pressure 162/70. Radioscopy, no hydrothorax. Urine, no albumin. Weight 10 st. 10½ lb. (68·4 kg.).

On discharge: No œdema. Weight 10 st. 5½ lb. (66 kg.).

CASE 9.—Male, aged 65. Aortic stenosis (arterio-sclerotic). Normal rhythm. Failure. One year, dyspnœa on exertion. Four months, nocturnal dyspnœa. Two months ago, in-patient with heart failure.

On admission: Orthopnœa, œdema of legs, moderate ascites, liver enlarged to umbilicus. Pulse-rate 80. Electrocardiogram, normal rhythm, low voltage all leads. Blood pressure 110/70. Radioscopy, no hydrothorax. Urine, trace of albumin. Weight 9 st. 6 lb. (60 kg.)

On discharge: No œdema. Liver not palpable. Weight 8 st. 2½ lb. (52 kg.).

CASE 10.—Male, aged 64. Chronic bronchitis and emphysema. Normal rhythm. Failure. Several years, "winter cough." One year ago in-patient with heart failure.

On admission: Orthopnœa. Slight œdema of ankles. Liver just palpable. Pulse-rate 78. Electrocardiogram, normal rhythm. Blood pressure 130/70. Radioscopy, no hydrothorax. Urine, no albumin. Weight 9 st. 5 lb. (60 kg.).

Progress: Œdema disappeared and liver no longer palpable, but very little relief of cough. Weight 8 st. 10 lb. (55·4 kg.).

The two drugs used as controls were salyrgan and novurit, the former because its value has now been well established, the latter in order to compare the effect of the same drug intravenously and by rectum. Both were given intravenously and never intramuscularly, salyrgan in the dose recommended by the makers, i.e., 2 c.cm. which contains 0·2 g. of the salt, and novurit also in the dose recommended, i.e., 2 c.cm. which contains 0·2 g. of the mercurial salt and 0·1 g. of the theophyllin.

No other drugs were administered if it could be avoided, excepting ammonium chloride as an adjuvant as described below. In only two cases was digitalis given during the period of observation, though naturally it was often used later. In one of these (Case 3) only 45 minims (3 c.cm.) of the tincture were given on the day of admission, three days before observations were begun. The other patient (Case 4) had severe congestive failure and auricular fibrillation, and digitalis had to be administered in view of a rising ventricular rate and increasing symptoms. Observations on the mercurial diuretics were therefore made only before digitalis was given and again in combination with digitalis when the effect of the latter on the urinary output had become stabilised.

Ammonium chloride as an adjuvant in the treatment of œdema with organic mercurial preparations has been widely adopted during the last ten years following upon the work of Rowntree, Keith, and Barrier,[12] and Keith and Whelan.[8] There is still no agreement as to the optimum dose, and in this investigation we have given it only for the 24 or

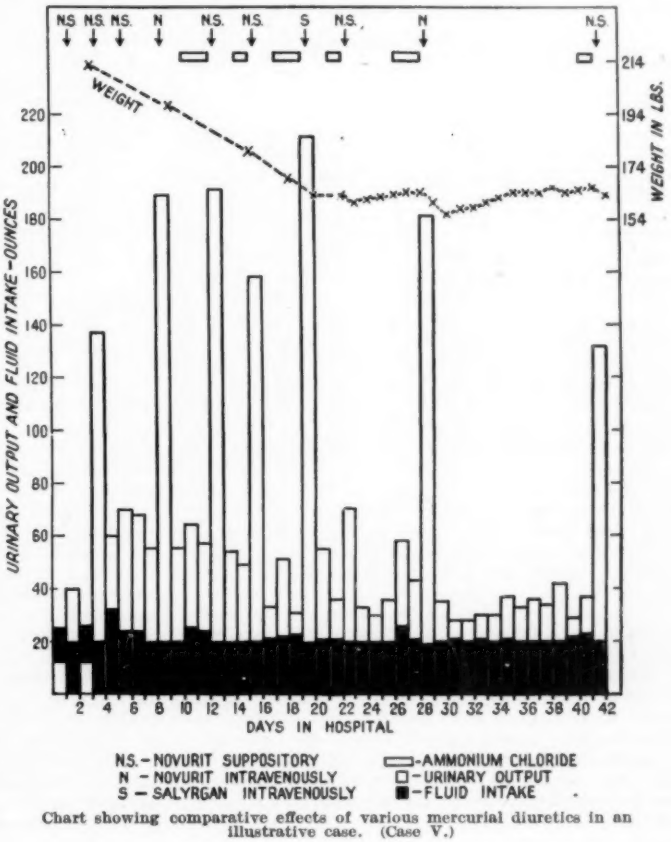

Chart showing comparative effects of various mercurial diuretics in an illustrative case. (Case V.)

48 hours preceding the exhibition of the mercurial preparation. In most cases it was given for 48 hours—grs. 120 (8 g.) during the first 24 hours and grs. 90 (6 g.) during the second. In the few cases where it was given for 24 hours only, the dose was grs. 120 (8 g.). There is difficulty in disguising its salty taste; in this series it was prescribed with liquid extract of liquorice, as recommended by the British Pharmaceutical Codex,[2] but the disguise is thin. The sucking of a lemon helped to remove the unpleasant taste from the mouth in some patients.

The *method of investigation* was as follows. The patient was kept in bed and a low-salt diet was ordered from the outset with a daily fluid intake restricted to 20–30 ounces (2000–2500 c.cm.). For the first three days, or until it was evident that the urinary output was steady, no treatment beyond rest was given. Thereafter the three preparations—novurit suppositories and novurit and salyrgan intravenously—were administered as follows.

SCHEMA

(1) Novurit suppository preceded by enema a few hours before.
(2) Novurit suppository. Aperient two nights before.
(3) Novurit suppository preceded by enema a few hours before. Ammonium chloride administered during previous 48 or 24 hours.
(4) Novurit suppository. Aperient two nights before. Ammonium chloride administered during previous 24 or 48 hours.
(5) Novurit intravenously with or without previous administration of ammonium chloride as in (3) and (4).
(6) Salyrgan intravenously with or without previous administration of ammonium chloride as in (3) and (4).

As a general rule one of these preparations was administered every third day.

RESULTS

In no case did we fail to obtain a diuresis with each of the drugs used. The accompanying Chart has been chosen as a typical example of the results achieved. The œdema began to diminish immediately and all clinical evidence of it had disappeared as a rule within a fortnight, the exact time varying with the initial degree of œdema. Thus in Case 6 there were no clinical signs of œdema a fortnight after treatment had been begun.

An equally satisfactory result was obtained in those cases with hepatic enlargement—in every case the liver returned to normal size. In Case 9, for example, where the hepatic enlargement was much more striking than the degree of œdema, the liver was not palpable at the end of a fortnight. The table summarises the results obtained in all the cases, and there are several points to which we would draw attention. Taking, in the case of each drug, the average 24 hours urinary secretion per dose, it is seen that for the novurit suppository this is 87·2 oz. (2470 c.cm.), for novurit given intravenously 121·1 oz. (3435 c.cm.), for salyrgan 91·8 oz. (2600 c.cm.).

The onset of diuresis was more rapid and tended to be less prolonged with salyrgan than with the other two drugs. Thus with salyrgan, taking the average percentage excretion per dose, 81·7 per cent. of the diuresis occurred during the first twelve hours, while with novurit and novurit suppositories the corresponding figures were 67·1 and 68·7 per cent. respectively. Further analysis shows that in the first four hours the average percentage excretion per dose was 44·9 per cent. for salyrgan, 25·9 per cent. for novurit, and 23·2 per cent. for novurit suppositories. The corresponding figures for the third four-hourly period were salyrgan 12·1 per cent., novurit 9·5 per cent., and novurit suppositories 14·9 per cent. Diuresis was never maintained beyond twenty-four hours.

Table showing the Twenty-four Hours Urinary Excretion following the Administration of Mercurial Diuretics

Case.	NOVURIT SUPPOSITORIES.			INTRAVENOUS NOVURIT.			INTRAVENOUS SALYRGAN.		
	With Ammon. chlor.	Without	Total	With Ammon. chlor.	Without	Total	With Ammon. chlor.	Without	Total
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
I. ..	..	138	138	..	..	..	..	114	114
	..	137	137	..	..	..	..	126	126
	..	88	88	..	..	..	..	..	..
II. ..	..	98	98	..	..	..	..	66	66
	..	64	64	..	..	..	..	76	76
	89	..	89	..	..	..	..	88	88
	..	55	55	..	..	..	..	..	..
III. ..	..	56	56	..	127	127	..	53	53
	..	114	114	..	..	..	..	..	..
	..	61	61	..	..	..	..	..	..
	..	32	32	..	..	..	..	..	..
	140	..	140	..	..	..	..	..	..
IV. ..	..	43	43	..	60	60	..	43	43
	..	69	69	..	..	..	..	..	..
	..	51	51	..	..	..	..	..	..
	15	..	15	..	..	..	..	..	..
V. ..	..	40	40	..	189	189	211	..	211
	..	137	137	181	..	181	..	..	..
	..	70	70	..	..	..	..	..	..
	191	..	191	..	..	..	..	..	..
	158	..	158	..	..	..	..	..	..
	70	..	70	..	..	..	..	..	..
	134	..	134	..	..	..	..	..	..
VI. ..	..	184	184	154	..	154	108	..	108
	206	..	206	..	..	..	112	..	112
	128	..	128	..	..	..	..	..	..
	110	..	110	..	..	..	..	..	..
VII. ..	..	21	21	..	64	64	..	62	62
	51	..	51	150	..	150	..	..	..
	76	..	76	..	..	..	..	..	..
	82	..	82	..	..	..	..	..	..
VIII. ..	..	43	43	..	..	..	94	..	94
	74	..	74	..	..	..	..	..	..
	47	..	47	..	..	..	..	..	..
	66	..	66	..	..	..	..	..	..
IX. ..	..	92	92	82	..	82	64	..	64
	68	..	68	..	..	..	..	..	..
	..	66	66	..	..	..	..	..	..
	57	..	57	..	..	..	..	..	..
X. ..	..	68	68	83	..	83	69	..	69
	90	..	90	..	..	..	..	..	..
	84	..	84	..	..	..	..	..	..
Average diuresis	96·7	78·5	87·2	130	110	121·1	109·7	78·5	91·8
In c.cm.	2760	2230	2470	3690	3120	3435	3110	2230	2600

The question as to whether it is desirable to secure evacuation of the bowels by means of an enema or an aperient was also investigated. It was found that with a preceding enema the average 24 hours urinary secretion was 98·4 oz. (2790 c.cm.), with an aperient two nights before it was 79·9 oz. (2266 c.cm.), while with neither it was 73·4 oz. (2082 c.cm.). As the numbers are so small, there is probably no statistical significance in these differences, and it may be concluded that the premedication treatment makes little difference provided there has been a satisfactory evacuation of the bowels. It was noted that several patients experienced more difficulty in retaining the suppository after an enema than after an aperient; on this account the aperient should be given two nights before the suppository, as, given

the night before, it would be more likely to leave the rectum in an irritable condition. The aperient used was liquid extract of cascara sagrada in doses of 1 fluid drachm (4 c.cm.).

With intravenous administration of the mercurial diuretics it is the general experience that the preliminary administration of the acid-forming salts results in a greater diuresis. Our figures, though small, support this belief, as in the case of novurit the diuresis with and without preliminary ammonium chloride was respectively 130 oz. (3690 c.cm.) and 110 oz. (3120 c.cm.), while for salyrgan the corresponding figures were 109·7 oz. (3110 c.cm.) and 78·5 oz. (2230 c.cm.). The results with the suppositories were similar, as with ammonium chloride the result was 96·7 oz. (2760 c.cm.), while without it the average 24 hours urinary secretion per dose was 78·5 oz. (2230 c.cm.).

No toxic or local irritative effects were observed except that in Case 1 after one suppository there was a small motion with each passage of urine, but without other upset. Further suppositories produced no such effects; nor did such effects arise in any other patient. All our patients received at least three suppositories in as many weeks (apart from successive intravenous injections), and one (Case 5) received seven within six weeks. The presence of a fissure or inflamed hæmorrhoids should doubtless be a contra-indication to their use. Occasionally the patient had difficulty in retaining the suppository, but even when it was retained for only two hours, the subsequent diuresis was satisfactory—e.g., Case 2 only retained the first suppository for two hours, yet the diuresis was 96 oz., while the second suppository, which was well retained, was only followed by a diuresis of 64 oz. In one case (5) the antecubital veins became so sclerosed that intravenous medication became difficult. This resulted in a slight leakage with the final dose of intravenous novurit. By the evening the forearm had become swollen and very tender and it did not return to its normal size until several days had elapsed. This is one of the disadvantages of intravenous administration, and is just as likely to occur with salyrgan.

DISCUSSION

Digitalis is of primary importance in the treatment of congestive heart failure. Often this is all that is required, but in a large proportion of cases some further therapy is necessary. For persistent dropsy, and even for a persistent hepatic enlargement, the organic mercurial diuretics are now the best means available.

From the results of this preliminary investigation we are not prepared to discriminate between novurit and salyrgan both given intravenously, though the Table suggests that novurit is rather more efficient. The studies of Limova,[9] Crawford and McDaniel,[3] and DeGraff, Nadler, and Batterman [4] are in favour of novurit.

In order to obtain information concerning the unaided action of these drugs, digitalis was not given either before or with the mercurial diuretics. In practice digitalis would nearly always be given before and with these drugs, and as a result a larger diuresis would be expected.

The main reasons for preferring rectal administration by means of a suppository to intravenous medication have already been stated. Rectal administration will prove particularly useful to a practitioner who does not happen to have regular opportunities for using drugs intravenously. In addition, there are cases where œdema of the upper extremities renders intravenous medication almost impossible. A further advantage is that the intelligent patient, under full medical supervision, should be able, if necessary, to insert the suppository himself.

The results reported here seem to indicate that as a diuretic the suppository is satisfactory, particularly in view of the fact that the degree of œdema in several members of the series was slight. The diuresis is not as great as with intravenous medication, although a larger amount of the drug is contained in the suppository than in the recommended intravenous dose, but such a finding is only to be expected in view of the smaller absorption there must be in rectal as compared with intravenous administration. Still a diuretic agent so simple to administer and which can produce a flow of 206 oz. (5840 c.cm.) in twenty-four hours and which on an average produces 87·2 oz. (2470 c.cm.) is an addition of value in the treatment of dropsy.

SUMMARY

(1) The therapeutic value of an organic mercurial diuretic which can be given as a suppository, the novurit suppository, has been investigated. This suppository, according to the manufacturers, contains 0·5 g. of novurit, a complex organic mercurial compound akin to salyrgan, but combined with 5 per cent. of theophyllin, in cocoa butter.

(2) Ten cases of congestive heart failure with œdema have been treated with this suppository and also with novurit intravenously and with salyrgan intravenously.

(3) The average twenty-four hours excretion of urine per dose was for the suppository 2470 c.cm. (87·2 oz.), for novurit intravenously 3435 c.cm. (121·1 oz.), for salyrgan intravenously 2600 c.cm. (91·8 oz.).

(4) The previous administration of ammonium chloride results in an increased diuresis with the suppository, as it also does with novurit and salyrgan intravenously.

(5) With the suppositories 68·7 per cent. of the diuresis occurred within the first twelve hours, while the corresponding figure for salyrgan intravenously was 81·7 per cent. The diuresis does not extend beyond twenty-four hours.

(6) No toxic or irritative effects of the suppository have so far been detected. Free evacuation of the bowels is desirable though not essential, and if an aperient is necessary, it should be given forty-eight hours before the suppository.

(7) It is concluded that novurit suppository is an effective and safe diuretic.

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HYPERVITAMINOSIS D

By Lewis Thatcher, M.D., F.R.C.P. Edin.

PHYSICIAN TO THE ROYAL HOSPITAL FOR SICK CHILDREN, EDINBURGH; LECTURER IN CHILD LIFE AND HEALTH IN THE UNIVERSITY OF EDINBURGH

THE case is that of a baby aged 11½ months whose health had been failing steadily for about four months without any obvious reason; he died four days after admission to hospital, when lesions characteristic of hypervitaminosis D were found in the kidneys.

CASE RECORD

Preliminary history.—In April, 1934, at the age of 4½ months, he was admitted to the Royal Edinburgh Hospital for Sick Children suffering from mild seborrhœic dermatitis. He was a well-nourished child, the body length being 26 in. and the weight 14 lb. 10 oz.; he had thriven well on artificial feeding, and was taking a reasonable ration of undiluted raw certified milk; he had been perfectly well except for the dermatitis that had been present for about three weeks. He was discharged cured in a fortnight, and brought up for inspection a month later, in June; he was very well, the skin was clear, and he had gained 1¼ lb. to 15 lb. 14 oz.; the diet was left as it was—raw milk without any additions. He was not seen again for nearly five months, until he was readmitted to hospital on Nov. 7th, 1934.

History.—His general health had been failing since the beginning of July; he lost his good colour and was always fretful, without actual pain or fever; there was persistent anorexia, with constipation, and he had become steadily worse during the last month. He had not gained weight satisfactorily, and there had been many fluctuations between July and mid-October, when he weighed 16 lb. 10 oz.; then there was a steady loss, and on Nov. 7th he weighed only 15 lb. 13¼ oz.—the same as five months before, although he had grown 2¾ in. in that time. He had been well cared for, and was out of doors constantly throughout the summer; the home conditions were good, in a pleasant open part of the city; he had been given two treatments with the ultra-violet lamp in October.

The *daily diet* had been as follows. Late June and July: 35–40 oz. of raw Grade A (T.T.) milk with about 1 oz. of sugar added; ten drops of cod-liver oil thrice daily; six teaspoonfuls of orange juice; Virol, for one week only. August: as before, but the milk was cut down to about 30 oz. and one feed of oatflour porridge or some other cereal was given; strained soup and gravy and potato were given occasionally, and the yolk of an egg twice a week; feeding gradually became difficult because of loss of appetite; cod-liver oil was given regularly, and the mother sought to combat the increasing weakness and flagging weight curve by giving as much as half to one teaspoonful (1 to 2 grammes) three times on many days. During September and October the diet was very much restricted because of the persistent anorexia; less than one pint of milk was taken, with a little mixed feeding; cod-liver oil and fruit juice were given as in August, and pressed upon the unwilling child.

Extract from case notes.—He is a pale, thin, and very feeble infant, collapsed but not severely dehydrated; rectal temperature subnormal; no œdema; muscles small and very soft; cranial bones well calcified, the anterior fontanelle being of normal size; eight good teeth. The urine is scanty in amount and strongly acid; there is a trace of albumin, and no sugar or acetone; on microscopical examination of a fresh uncentrifuged specimen a few pus cells are seen—about four to the high-power field; no red blood corpuscles, and no casts after centrifuging. *Staphylococcus aureus* was cultured from the urine, but this was assumed to be a contamination because a specimen taken two days later was sterile; (post mortem, the genito-urinary tract was found to be free of pyogenic infection).

End of illness.—A diagnosis of terminal pyelonephritis was made, but no explanation could be given for the persistent failure to thrive, and for the fact that the urine was sterile. The urine was alkalinised within 24 hours without improvement in the baby's general condition; there was irregular and increasing pyrexia, and several convulsions with a normal cerebro-spinal fluid; death took place four days after admission to hospital.

POST-MORTEM FINDINGS

A post-mortem examination was performed by Dr. Agnes Macgregor, pathologist to the hospital, who reported as follows.

The body was that of a small, thin male infant. The bones were well calcified and their ossifying junctions appeared to be normal. Apart from slight hypostatic congestion and œdema of the lungs, and mild fatty degeneration of the liver, the only significant pathological changes were in the kidneys. These were swollen, pale, and rather severely congested in a patchy fashion. On section there were found peculiar deposits of a grey granular material, very slightly gritty, which formed a narrow line along the bases of the medullary pyramids. This material could not be expressed or removed by scraping. It was present in every pyramid of both kidneys, but could not be detected elsewhere with the unaided eye. There were no foci of suppuration. The pelves and ureters were healthy.

Microscopical examination.—In certain tubules of the *kidney* there were deposits of a material which, both with hæmatoxylin and with von Kossa's silver nitrate method, gave staining reactions characteristic of calcium (see Figures). These were most numerous and largest in the medulla, especially at the bases of the pyramids, but they were present also in the cortex, where they were very small. The calcium-containing material occupied the lumen of the tubules, sometimes completely filling it; in some instances cells attached to the wall of the tubule, or lying free in the lumen, were calcified. Around all the larger and some of the smaller deposits there was some proliferation of cellular fibrous tissue. In the cortex a few glomeruli contained calcium deposits, the affected tufts being swollen and the capillaries obliterated. There were some small foci of mononuclear-cell infiltration, unrelated to calcium deposits; some dilatation of groups of tubules which contained "colloid" casts; parenchymatous degeneration of the epithelium of tubules in the cortex; and slight œdema of the stroma. The arteries were healthy. No evidence of pyogenic inflammation was found. The *liver* showed slight fatty degeneration. Microscopical examination of lung, myocardium, stomach, spleen, lymph gland, thymus, thyroid, parathyroid, aorta, and various arteries revealed no pathological changes.

Pathological diagnosis.—The lesions in the kidneys were similar to those described in previously reported fatal cases of hypervitaminosis D in the human subject, and closely resembled those produced in animals by experimental administration of excessive quantities of vitamin D.

DISCUSSION

A clinical diagnosis of hypervitaminosis D should have been considered, for the illness resembled very closely that known to be caused by excessive doses of vitamin D and by minute amounts given to infants who are abnormally sensitive to the action of the drug. It was not realised that the baby might have been affected by the vitamin D in the cod-liver oil that had been administered daily in considerable doses throughout four summer months, augmented as it was by that contained in a full ration of fresh cow's milk and by that formed in his tissues under the influence of sunshine—to which he had been exposed a great deal throughout the summer. In addition, he had been given two treatments with the ultra-violet lamp about three weeks before he died; these were not persevered with because irradiation did not seem to suit him. No other cause for his illness was found either before or after death, for the condition of the urine did not indicate a severe infection of the urinary tract. It is known that

he was perfectly well and thriving satisfactorily without any signs of rickets just before the institution of the intensive antirachitic régime that was carried out without remission from June to the end of October.

In 1924 A. F. Hess [1] and also Steenbock and Nelson [2] discovered that ergosterol was endowed with antirachitic properties by exposure to the rays of an ultra-violet lamp, and it was proved that this was due to the formation of vitamin D. More recently the pure vitamin was isolated in crystalline form from this preparation,[3] and given the name of calciferol; its potency is about 40,000 international units of vitamin D in a milligramme, whereas a good sample of cod-liver oil contains only about 100 per gramme.

Very soon after the introduction into the practice of medicine of preparations containing irradiated ergosterol reports of its toxicity in certain circumstances began to appear. Experimentally Pfannenstiel[4] found that a dose 100 times greater, than the minimum antirachitic one did not produce any recognisable effect on rats; one 1000 greater was definitely harmful when taken over long periods of time; and one 10,000 greater was strongly toxic. Moreover, it was recognised that these ill-effects are exaggerated when the diet is modified in certain ways (especially when it is insufficient or badly balanced), that young and non-rachitic animals have less tolerance than those that are mature or rickety, and that there is a conspicuous difference in the susceptibility of different species as well as a possibility of individual idiosyncrasy. It is important to note that animals may recover very quickly if the drug is withheld in reasonable time. There is abundant evidence that infants also may react badly to "safe" doses [5 6]; there may be a true idiosyncrasy. It has been found that undue susceptibility is most common in premature or feeble infants, and in those that are not rickety; in addition, tolerance may be lowered by febrile illness and by exposure to the rays of the sun and of the ultra-violet lamp.[7-10]

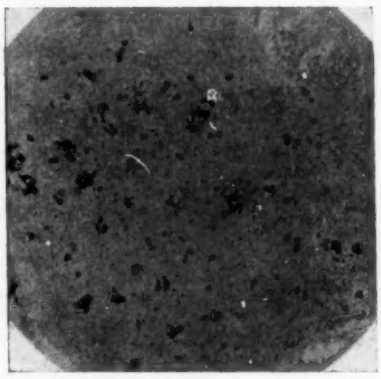

FIG. 1.—Section through base of pyramid showing calcium deposits. von Kossa's stain. (× 35.)

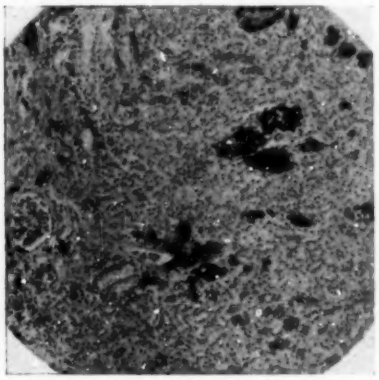

FIG. 2.—Calcium deposits in tubules at base of medullary pyramid. Hæmatoxylin and eosin. (× 75.)

The indications that vitamin D is exerting a toxic influence may be summarised as follows. There is failure of general health without obvious cause, and progressive asthenia is associated with marked atony of the muscles; persistent anorexia is a striking feature; there may be vomiting and slight diarrhœa at first, followed by constipation; the mental state

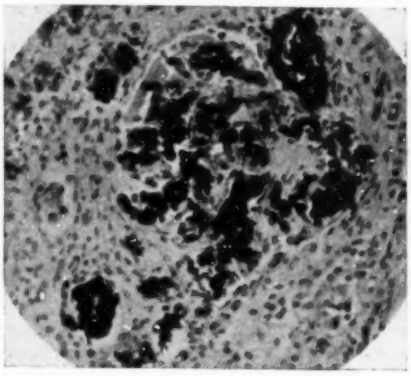

FIG. 3.—Calcified masses of one of the larger deposits showing calcified masses in tubules and slight fibrosis. Hæmatoxylin and eosin. (× 160.)

is abnormal (fretfulness with a strange apathy); there is neither pain nor fever; the weight is likely to be stationary for some time, followed by a steady decline; albuminuria and pyuria seem to be found constantly in the later stages; there may be a rise in the amount of inorganic blood phosphate without a corresponding hypercalcæmia.

The post-mortem findings are conclusive, for they are pathognomonic of hypervitaminosis D. We do not know of any other agent, or any disease, that will cause the characteristic deposition of calcium salts in the tissues; it is found always in animals that have been poisoned with vitamin D, and is most abundant in the kidneys and urinary passages—where there may be calculi—and in the walls of the great arteries. The state of the kidneys in the case reported in this paper is similar to that described in the two other cases of hypervitaminosis D affecting babies in which the diagnosis was established by careful post-mortem examination [11 12]; calcification of other tissues has not been seen in the human subject.

I can find the record of one case only in which fatal illness may have been caused by the vitamin D contained in cod-liver oil.

Malmberg,[13] following the work of Agduhr and other Scandinavian workers, reported the case of an infant one week old who was given half a teaspoonful of the oil daily. It disagreed, causing vomiting that ceased immediately the oil was withheld; it was given again about a fortnight later in half a teaspoonful dose twice a day; this was increased soon to a teaspoonful at the same times, and was continued in this amount until the baby died when she was 4 months old. The diet was human milk, fruit juice, and a little butter gruel occasionally. There had been inexplicable failure of health for several weeks before

death; the weight was stationary, but loss was obscured by the presence of subcutaneous œdema; there was neither vomiting nor diarrhœa; the state of the urine was not described. Post mortem, the only significant findings were degenerative changes in the myocardium and elsewhere similar to those found in experimental animals that had been given excessive amount of cod-liver oil for a long time; but the deposition of calcium in the urinary tract was not noted and, therefore, the case cannot be accepted as one of hypervitaminosis D.

It is common experience that a reasonable dose of cod-liver oil is extremely well tolerated by infants, and that digestive disturbance may be brought about by injudicious use of it. The signs, as a rule, are those of gastro-intestinal irritation with diarrhœa, and they clear up quickly when the oil is withheld, or a smaller dose given. It is conceivable that ill-effects might be brought about if intestinal peristalsis was unhurried, permitting more complete absorption, and especially in the presence of constipation that seems often to accompany vitamin-D poisoning.

It is important to know that the vitamin-D content of cod-liver oil has been definitely increased during the last few years; the monopoly that it enjoyed as an antirachitic agent was broken by the introduction of numerous well-advertised preparations containing calciferol—the potency of which is made much of—and this intensive competition had to be met. Not long ago many samples contained little or no vitamin D; now most of the oil that is sold is standardised to contain a certain number of international units per gramme. I have ascertained the certified potency of eight samples that are available on the British market; five popular brands contain about 100 international units, one has 140, one 160 (both of these are fortified by the addition of halibut oil), and one 200; the latter is a natural Norwegian oil, and was used in the case reported here.

SUMMARY

The case is that of a baby aged 11½ months known to be thriving and free of rickets just before the addition to the daily diet—at the beginning of June—of a considerable dose of cod-liver oil with an exceptionally high vitamin-D content. He had been brought up on raw cow's milk, fruit juice, and the customary amount of mixed feeding; he was out in the open air and sunshine a great deal, and had been given abundant opportunities for muscular exercise. He died early in November after an illness similar to that described as being caused by hypervitaminosis D. Post mortem, changes pathognomonic of that condition were found in the kidneys.

CONCLUSIONS

Young infants may have idiosyncrasy to the vitamin D contained in cod-liver oil as well as to artificially prepared calciferol. The present-day tendency to increase the vitamin-D potency of cod-liver oil is undesirable and unnecessary; that to which the public is accustomed, and upon which popular dosage is based—viz., about 100 international units per gramme—is sufficient for all purposes. There is no reason whatever to administer cod-liver oil to infants during the summer months when diet and hygienic conditions are satisfactory and there is no evidence of rickets.

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B. AERTRYCKE FOOD POISONING

DUE TO CONTAMINATION OF FOOD WITH EXCRETA OF MICE

BY E. R. JONES, M.D. Liverp., D.P.H.
ASSISTANT CITY BACTERIOLOGIST; AND
H. D. WRIGHT, M.D., D.Sc. Edin.
PROFESSOR OF BACTERIOLOGY IN THE UNIVERSITY OF LIVERPOOL

THE details of this small outbreak of food poisoning caused by *B. aertrycke* (*Salmonella typhi murium*) have appeared worth recording because the source of infection seems to have been definitely proved to be food contaminated with mouse fæces and also because of the impression we have formed that the completeness of the chain of evidence was due to the use of tetrathionate broth and brilliant green-eosin agar.

The outbreak involved five members of one family, living in conditions of poverty and squalor in a poor quarter of Liverpool.

The first case was a child of eight months who was admitted to Fazakerley hospital for infectious diseases on Oct. 22nd, 1935, with a large abscess in the left buttock and smaller ones in the right groin and on the dorsal surface of the left wrist. He was in a somewhat collapsed condition and suffered from diarrhœa which, the mother stated, had lasted for some days. The condition gradually became worse and the patient died on Oct. 27th. A specimen of fæces examined on Oct. 23rd yielded a heavy growth of *B. aertrycke*, largely in the group phase. At a post-mortem examination on Oct. 28th the abscess was found to be due to *Staphylococcus aureus* and was peculiar in that it contained a large mass of necrotic fat and subcutaneous tissue, about 3 in. by 1 in., lying free in the cavity. Changes in the bowel were those of slight inflammatory congestion and in the other organs those associated with toxæmia. *B. aertrycke* was isolated from the contents of the stomach, jejunum, ileum, ascending colon, and rectum, and from the spleen and heart blood. Serum collected at autopsy agglutinated salmonella group suspension in a dilution of 1 in 640 and *B. aertrycke* (type) suspension at 1 in 320.

On further inquiry it was ascertained that the father, mother, and two sisters of the dead child had all begun to suffer from diarrhœa on Oct. 24th, two days after the child had been removed to hospital. The attacks were mild and lasted in one case for one, and in the others for three days. Specimens of fæces from all four cases collected on Oct. 30th yielded cultures of *B. aertrycke*. Sera collected from three of the patients on Nov. 8th agglutinated standard suspensions as follows:—

	Salmonella group.	Aertrycke type.	Aertrycke O.
Patient A ..	1 in 20 ..	1 in 40 ..	Nil
„ B ..	1 in 80 ..	1 in 40 ..	1 in 80
„ C ..	Nil ..	1 in 40 ..	1 in 80

In view of the age of the first patient (8 months) and the nature of the infection it was suspected that

(*Continued from previous column*)

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milk might be the vehicle of infection and mice the source. Through the courtesy of the medical officer of health for Liverpool (Prof. W. M. Frazer) it was possible to examine six mice trapped in the house between Nov. 5th and 7th. From the intestinal contents of one of these *B. aertrycke* was isolated. The intestinal contents and spleen of the other five failed to provide cultures of this organism, as also did the spleen of the mouse whose fæces contained *B. aertrycke*.

A partly used tin of a dried milk preparation with which the child had been fed was fortunately available for examination. This was found to contain several pellets of mouse fæces of which four were examined, and from one *B. aertrycke* was isolated.

It seems reasonable to suppose that the infant was infected via the milk and that this had become infected by contamination with mouse fæces. So far as could be ascertained no other member of the family had consumed any milk and it is possible that they may have been infected from the first case. At the coroner's inquiry it was made clear that the conditions in the house and the habits of the inmates were such as to render this highly probable.

The possibility that rats or mice might be the source of infection in some outbreaks of food poisoning has been suggested by several workers, notably Bainbridge (1912) and Jordan (1931), in view of the fact that rodents are not infrequently found infected with organisms of the salmonella group under natural conditions. Most workers have found *B. enteritidis* (Gaertner) the infecting agent in rats, while in guinea-pigs and mice it is more often *B. aertrycke*. But although outbreaks have been traced by various authors (Shibayama 1907, Willfuhr and Wendtlandt 1921, Spray 1926) to the contamination of food with "rat virus" this has usually been due to direct contamination of utensils without the intervention of the mouse or rat. The only instance of association with naturally infected mice which we have been able to trace occurred in the outbreak described by Salthe and Krumwiede (1924) which appears to have been well established. Another possible case is the outbreak No. 51 in the series recorded by Savage and Bruce White (1925), though the mice in this instance were not examined until some weeks after the outbreak occurred.

We have been unable to obtain any evidence that "rat virus" was employed for rodent destruction in the neighbourhood where these cases occurred. As most of these viruses contain *B. enteritidis* (Gaertner) the infection is unlikely to have come from such a source. The house was found to be badly infested with mice and little or no effort had been made to protect food from them.

We have been interested to find that Williams, Murray, and Rundle (1910) recorded a group of seven cases of "summer diarrhœa" in Liverpool from which they isolated organisms of the salmonella group. The first of our series might easily have been so diagnosed.

The ease with which the chain of evidence has been established in this outbreak is in no small part due to the use of specially satisfactory media. These have consisted of an enrichment broth containing sodium tetrathionate prepared as described by Schäfer (1935) following Müller (1923) and an agar medium containing brilliant green and eosin described by Teague and Clurman (1916) and recommended by Meyer and Stickel (1918). We have found this combination extremely valuable in the isolation of all members of the typhoid-paratyphoid group but apparently of no value for dysentery bacilli. Kauffmann (1930, 1935) has also reported very favourably on the employment of a modified tetrathionate broth for the investigation of intestinal infections. As these media appear to be so satisfactory we think our experience may be of interest to those engaged in the investigation of these conditions.

We wish to express out indebtedness to Prof. Frazer and his staff, especially to Dr. B. T. J. Glover, for assistance in obtaining material for examination and for data regarding the onset of the attacks, and to Dr. A. E. Hodgson for the opportunity of investigating the first case and for clinical information.

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Clinical and Laboratory Notes

"MORBUS BRITANNICUS"

A FORM OF FIREMAN'S CRAMP

BY SV. E. KOFOED, M.D.

MORBUS BRITANNICUS is the name we have given a special sort of fireman's cramp, seen very often among the sailors of British trawlers coming to the Faroe Islands. It is never seen among Scandinavian sailors. In the "Ship Captain's Medical Guide" (London, 1929), by D. D. F. Macintyre, the disease is described as follows:—

"Firemen are peculiarly liable to a severe form of cramp, which affects the muscles of the belly, arms, and legs. The patient is usually discovered groaning and writhing on the deck, with his extremities curved, in excruciating pain, and his muscles drawn into hard rigid knots. . . . There may be frequent watery stools and signs of collapse. . . . The complaint is specially prevalent after leaving home ports, and decreases when well in blue water. . . . It attacks men who drink large quantities of cold water when the body is overheated. . . . Treatment: As the condition is due to deficiency of salt in the system, the treatment should be directed towards rectifying this deficiency. A pinch of salt should be put in every drink the men take in the stokehold. A hot salt-water bath will afford speedy relief. In bad cases an enema of warm salt solution—a teaspoonful of salt to the pint of water—may be given. . . . Other treatment is to rub the affected parts with turpentine liniment and to give a dose of cramp mixture, which may be repeated in half an hour if necessary."

The picture of the illness we have seen in the Faroe Islands, and which we have given the name of morbus Britannicus, is not quite identical with the one given by Macintyre, but there are so many points of similarity that we conclude that it must be fireman's cramp. Of the 30 patients in whom we have made this diagnosis, 10 were firemen, 6 trimmers, 3 engineers, and 5 cooks, and 6 had other occupations. Eleven were less than thirty years old, 11 between thirty and forty, and 8 more than forty.

The symptoms include headache, abdominal pain, and constipation—sometimes diarrhœa, but more

frequently constipation, which must be emphasised as a feature differing from the above description. Further were observed nausea, vomiting, and pain in the muscles of the belly, arms, and legs. The pain is often very alarming and spasmodic; only seldom have we seen generalised tonic and clonic spasms—namely, in cases when the disease has lasted a very long time, or where there was complicating organic stenosis of the pylorus. There have been only 5 cases with generalised spasm.

We have not seen fever. The pulse is ordinarily normal, in some cases a little more rapid than usual. The patients are pale, shocked, and apathetic. The spasm of the belly can be so intense that it looks like a regular pseudo-defence. This we have seen in 10 cases. It is therefore easy to understand that the diagnosis may be difficult, because the question of ulcer, cholelithiasis, or appendicitis arises. The patients may be suffering from terrible pain and the muscles iron-hard. The abdomen is boat-like, retracted, and diffusely painful. The spasm takes all the muscles of the abdomen more specially the recti abdominis. Therefore one considers first of all the possibility of a perforation with consequent peritonitis; but the picture is usually less violent, there is less shock, and pulse and temperature are not affected. Also flatus is usually free. Nevertheless we have in 3 cases very nearly diagnosed appendicitis, in 1 case cholelithiasis, and in 2 cases gastric ulcer.

In such doubtful cases it generally suffices to observe the patient carefully for some hours and give a small glycerin enema. Then we see opening of the bowels, and the patient will pick up. If one thinks of the possibility of fireman's cramp one is almost sure to get information about pain in the muscles of the arms and legs and find tetanic and rigid muscles.

We have the impression that the abdominal spasm comes first, perhaps because there is constipation. Another question is connexion with sea-sickness. We have no doubt that this is often present and partly causes the headache, nausea, and vomiting. Fireman's cramp is due to loss of salt by sweat, and naturally this is aggravated by sea-sickness, where there is loss of chlorine ions by vomiting, which in itself can lead to gastric spasm.

We have also seen cases of ulcus ventriculi complicated with morbus Britannicus. In one of these there was a violent spasm of pylorus accompanied by universal tonic spasm. The very ill patient was most strikingly relieved by two intravenous injections of 5 c.cm. 10 per cent. of calcium chloride. Later a radiogram showed great dilatation of the stomach due to a duodenal ulcer. The other patient had a less violent attack of spasm. After the attack we discovered distinct symptoms of a stenosing ulceration of the stomach, and he was operated upon by a retrocolic posterior gastro-enterostomy. Since then he has been well and he is now cook in a trawler.

Remembering Prof. J. S. Haldane's researches into "miner's cramp," we have looked for chlorides in the urine. These were never completely absent, but the reaction was very weak in spite of the small diuresis. We have not yet been able to make quantitative researches on the chlorides in urine and blood, but we intend to do so in future. In our cases it seems that the amount of chlorine is more important than the amount of sodium chloride, and we have seen good results from calcium chloride per os, per rectum, or intravenously. Experienced captains believe that starvation and excesses are predisposing causes; also previous diseases. We have seen a case of morbus Britannicus occurring just after a bad attack of malaria, and this was in a trimmer forty years of age who had been at sea for many years all over the world. As a direct cause bad weather is almost always observed.

We have never seen this disease among the fishermen of the Faroe Islands, and I think this is due to the salt food of these men. Sea-sickness is the same for British and other sailors, and so cannot be the cause of the prevalence among British sailors.

Morbus Britannicus is rather an important disease on British ships, which is proved by the fact that we in Klaksvig (in the northern part of the Faroe Islands) in the last three years have treated 180 British sailors, of whom 30 were suffering from this disease. We shall therefore conclude by suggesting that salt meat should be introduced as a part of the food on British ships, because this has proved to be preventive against the illness on Scandinavian ships. The treatment recommended in the "Ship Captain's Medical Guide" has not been effective, because the men are sea-sick at the same time and vomit the salt drink recommended, and usually do not trust themselves to give enemas. Prevention is most certainly in these cases best.

SEVERE SYPHILITIC ANÆMIA OF THE PERNICIOUS TYPE

BY CHARLES R. BOX, M.D., F.R.C.P. Lond., F.R.C.S. Eng.
CONSULTING PHYSICIAN TO ST. THOMAS'S HOSPITAL, LONDON; AND
A. MORTON GILL, M.D. Lond.

SYPHILIS is a common disease and pernicious anæmia by no means rare, and yet the combination of the two diseases in the same patient is not often seen. In cases of severe anæmia with a positive Wassermann reaction it is usual to follow Stokes's classification [1] which is as follows:—

(1) True pernicious anæmia with a false positive Wassermann reaction.
(2) True pernicious anæmia in association with syphilis.
(3) Severe anæmia due to syphilis.

We believe that the following case belongs to the third group, and we have therefore endeavoured to trace any previous case, clinically and hæmatologically resembling pernicious anæmia, with a positive Wassermann reaction showing no response to stomach extract, but restored to normal by antispecific measures only. We have been unable to find any record of such a case.

In the days before liver and stomach extract therapy, Labbé [2] in 1906 reported a case of severe anæmia in a syphilitic which failed to respond to iron but was cured by mercury; Nathan [3] in 1914 reported a case of pernicious anæmia and syphilis cured by antispecific measures only; while Naegeli [4] had a case of pernicious anæmia and tertiary syphilis which responded to arsenic and mercury, in 1893, and was well when seen in 1918. Since the introduction of liver by Minot and Murphy, de Lillo [5] has reported a case of pernicious anæmia and syphilis, cured by antispecific measures only, but the effect of liver or stomach extract was not tried. The following case, therefore, appeared to us to be of interest:—

History.—The patient, a man aged 48, was admitted to the Royal Masonic Hospital on Oct. 14th, 1934,

—	1934.						
	Oct. 16th.	Oct. 30th.	Nov. 17th.	Nov. 30th.	Dec. 6th.	Dec. 13th.	Dec. 20th.
Red cells (millions)	1·480	1·530	3·090	3·150	3·610	3·510	3·460
Hb. per cent. ..	36	40	64	65	66	74	71
Colour-index ..	1·2	1·29	1·03	1·03	0·92	1·06	1·03
Anisocytosis ..	+	+	..	..	..	..	..
Poikilocytosis ..	+	+	..	..	..	..	..
Punct. basophilia ..	..	+	..	..	..	..	..
Polychromasia ..	+	+	..	..	..	..	..
Normoblasts	...	+	...	...	...	...	...
White cells ..	5000	5000	6000	7000	5000	8000	8000
Polymorphs ..	31·0 %	38·3 %	..	..	..	..	..
Small mononuc. ..	64·7 %	51·7 %	..	..	..	..	..
Large mononuc. ..	2·7 %	4·0 %	..	..	..	..	..
Eosinophils ..	1·6 %	6·0 %	..	..	..	..	..
Mast cells	0·0 %	0·0 %	..	..	..	..	..

—	1935.				
	Jan. 3rd.	Jan. 14th.	Jan. 22nd.	Jan. 31st.	May 31st.
Red cells (millions)	3·740	4·280	3·940	4·930	5·460
Hb. per cent. ..	79	79	76	94	104
Colour-index ..	1·05	0·93	0·96	0·96	0·95
Anisocytosis ..	+	..	+	..	..
Poikilocytosis ..	+	..	..	..	..
Nucleated red cells	...	...	+	...	...
White cells ..	7000	7000	7840	5440	8400
Polymorphs ..	44·3 %	..	52·2 %	53·0 %	49 %
Small mononuc. ..	26·7 %	..	26·3 %	17·0 %	21 %
Large mononuc. ..	4·0 %	..	8·6 %	8·0 %	16 %
Hyalines	..	..	6·6 %	10·5 %	10 %
Eosinophils ..	5·0 %	..	6·3 %	11·5 %	4 %

complaining of nasal catarrh of some ten months' duration. On admission his pallor was such a striking feature that it was apparent that there was something more seriously amiss than nasal catarrh, and, on being questioned, he admitted that he also suffered from dyspnœa on slight exertion, palpitations, giddiness, and feelings of pins and needles in both arms and legs. His occupation was that of an accountant, and he had a wife and family, all in good health.

Examination.—The mucous membranes were pale and the patient had a bilateral malar flush. He was somewhat thin, his weight being 8 st. 9 lb. 7 oz. His tongue was smooth with atrophy of the papillæ, his teeth false. The heart was clinically slightly enlarged to the left, and a loud blowing systolic murmur was audible in all areas; the blood pressure was 140/70 mm. Hg; examination of the optic fundi revealed much pulsation in the retinal veins, together with the presence of opaque nerve-fibres on both sides. The liver and spleen were both palpable. No abnormal physical signs were detected in the respiratory or central nervous systems, and examination of the urine was negative. The patient also presented a rash, and this was seen by Dr. A. C. Roxburgh who reported as follows: "Psoriasiform shiny scaly papules elbows and backs of hands. Peeling areas both palms."

Response to treatment.—Clinically the case was one of pernicious anæmia and the patient was placed on adequate doses of stomach extract by mouth. He was also given a mercurial ointment to be applied to the areas affected by the rash. A blood count and fractional test-meal appeared to confirm the diagnosis, as the laboratory reports show.

On Oct. 25th he complained for the first time of nausea with abdominal discomfort, and in view of the absence of free hydrochloric acid as shown in the test-meal, he was given a mixture containing pepsin and dilute hydrochloric acid at meal-times. There was no clinical improvement in his condition, so that we were not unduly surprised when a blood count on Oct. 30th also failed to reveal any progress. On this date he was again seen by Dr. Roxburgh, who made a note that the psoriasiform patches had almost disappeared. The fact that a rash, affecting both palms, had rapidly improved on an ointment containing mercury seemed suspicious, and on the same day a blood Wassermann reaction was done and found to be strongly positive. We thereupon decided to try the effect of antispecific measures alone. All previous therapeutic measures were abandoned and the patient was placed on a mixture containing pot. iod., grs. 10, and liq. hydrarg. perchlor., ℥ 30 t.d.s., p.c. The next blood count, a fortnight later, showed a 100 per cent. improvement, and the dose of potassium iodide was increased to grs. 15 and of liq. hydrarg. perchlor. to ℥ 45. The next count, on Nov. 30th, showed no improvement, and the dosage of potassium iodide was increased to grs. 20 and the liq. hydrarg. perchlor. to ℥ 60. On Dec. 6th the blood count had again improved, the red cells having increased by nearly half a million, and on Dec. 13th, although the red cells were approximately the same, the hæmoglobin had risen by 8 per cent.

The next blood count was disappointing, and so intravenous N.A.B. (neoarsphenamine) was begun, the first dose of 0·6 g. being given on Dec. 21st. This was given at weekly intervals while the patient remained in hospital, with a steady improvement in the blood picture. The patient's general condition also improved enormously; all his symptoms disappeared, including profuse night sweats, concerning which he had complained bitterly, and he was discharged on Feb. 11th, 1935, having gained over a stone in weight since admission.

On May 30th he was readmitted to hospital for estimation of progress. Since his discharge from hospital he had returned to business and had been taking Hutchinson's pill, 2 t.d.s., p.c. Apart from this, he had had no treatment since leaving hospital. He looked and felt a new man, and a blood count on May 31st was normal with the exception of a rather high colour-index. After a further test-meal, and a blood Wassermann reaction which proved to be still positive, he returned home on June 2nd. Five more N.A.B. injections were given in June and July, and in a letter written in December he states that his health is excellent. He continues to take Hutchinson's pills.

Laboratory investigations.—Fractional test-meals on Oct. 18th, 1934, Jan. 24th, Feb. 8th, and June 1st, 1935, all showed a complete absence of free hydrochloric acid and a very low total acid curve. Blood Wassermann tests on Oct. 29th, 1934, Jan. 23rd and May 31st, 1935, were all strongly positive. The blood counts are set out in the accompanying Table.

DISCUSSION

A case is described presenting symptoms, signs, and blood picture closely resembling Addisonian pernicious anæmia with, in addition, syphilis; the disease failed to respond to adequate doses of stomach extract, but showed a gratifying improvement under antisyphilitic measures only. We cannot believe that this was a natural remission, unconnected with the therapeutic measures adopted; the improvement both in the general condition and in the blood picture was so steadily progressive, particularly after the administration of N.A.B. was begun, that we feel no doubt that the one was intimately connected with the other.

There remains the problem as to the site of the lesion. Had this been a syphilitic gastritis, causing atrophy of the pyloric and fundus glands (as was suggested by the fractional test-meals), then one would have expected a response to stomach extract, which supplies both hæmopoietin and the anti-anæmic principle. Whether a syphilitic lesion elsewhere in the gastro-intestinal tract could interfere with the absorption of the anti-anæmic principle seems to us problematical. There remain two other possibilities: either that a syphilitic lesion in the liver prevented storage of the anti-anæmic principle (cf. pernicious anæmia in hepatic cirrhosis) or that the bone-marrow was affected in some way by the spirochæte, so that normal formation of the red cells was prevented.

Our thanks are due to Dr. Roxburgh for his reports on the skin condition, to Dr. J. Bamforth for the last

three blood counts, and to Dr. Eastes's laboratory for all the other pathological investigations.

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THE SYNDROME OF CROCODILE TEARS

By I. A. Tumarkin, M.B. Liverp., F.R.C.S. Edin.

HON. AURIST TO THE BOOTLE HOSPITAL

Incomplete recovery after Bell's palsy occurs in about a fifth of the cases observed, and these may be afflicted in a variety of ways. One of the most interesting, and incidentally most distressing, is the syndrome of crocodile tears.

Briefly, this consists of a troublesome epiphora which occurs during mastication. This is to be distinguished from the epiphora which occurs in the *early* stage of most facial palsies, and which is, of course, due to the paralysis of the orbicularis palpebrarum. The crocodile tears appear *late*, even in the presence of an active orbicularis, and although some epiphora may or may not be produced by exposure to wind and so on, yet the really copious flow is only excited by the act of mastication. In a severe case the patient is constantly mopping his eye during a meal, and may indeed develop a secondary blepharitis.

Considering the comparative frequency of this syndrome, it is surprising that it should have received such scant attention. In a recent investigation,[1] I found, in confirmation of A. B. Duel's figures, that fully 20 per cent. of Bell's palsy do not recover completely. Out of these incomplete recoveries, no less than 80 per cent. (15 out of 18) showed crocodile tears to a greater or less extent. Three certainly complained bitterly of it.

Theory of causation.—This syndrome is interesting in connexion with the associated movement often seen even in patients who regard themselves as cured. Such a patient is unable to contract one set of muscles without throwing other sets into action. When told to close the eye, he also unconsciously contracts the mouth or nose muscles. This is not to be attributed to spasm or hypersensitivity of the muscles, or to some overflow of energy in the facial nucleus. A much simpler explanation is available as follows: the nerve having undergone degeneration, new axons are pushing their way out seeking their various destinations. Unfortunately some are diverted, and find their way to the wrong muscle or gland. Thus, when, for instance, the nerve centre for the orbicularis palpebrarum goes into action, some of its energy output is carried via aberrant axons to other muscles. An explanation suffices for crocodile tears—i.e., that fibres intended for the parotid gland are diverted to the lacrymal so that during mastication the salivatory nucleus is also bombarding the lacrymal gland with secretomotor stimuli.

Sundry anatomical points are raised by this theory. It seems clear that the lacrymal gland is supplied by the facial nerve, and the actual path postulated is as follows: great superficial petrosal—vidian—spheno-palatine gang. Spheno-palatine nerve—sup. maxillary division of the fifth. The latter communicates via its orbital branch with the lacrymal nerve, and so reaches the gland. I am not aware of any explanation for this fantastic course, but there seems no doubt that the petrosal nerve really carries lacrymatory fibres. Dandy has shown that in the anterior approach to the Gasserian ganglion, the petrosal is liable to be damaged, and that this results in diminished flow of tears.

The parotid is also supplied by the facial, via the chorda tympani, which sends a branch to the otic ganglion. This disposes of the theory that the glossopharyngeal is responsible via Jacobson's nerve, the tympanic plexus, and the small superficial petrosal nerve. In point of fact, Jacobson's nerve has recently been shown to be sensory, and indeed to be the source of that particular subdivision of glossopharyngeal neuralgia known as tympanic neuralgia.

The pathological and surgical implications of this theory are of considerable importance. To begin with, it is clear that the strangulation (or whatever the lesion is in Bell's palsy) must, in these particular cases have affected the nerve where the petrosal is given off—i.e., in the region of the geniculate ganglion. Such a case would not presumably benefit from a decompression limited to the vertical portion of the Fallopian canal. It would be necessary to uncap the nerve in its paratympanic course—an operation of the utmost finesse. Again, it is possible that we may find in a lacrymatory test some quite valuable information as to the location and severity of the lesion. Whilst absence of epiphora in the early stages of a Bell's palsy might be due to a mild lesion, it is more likely to be due to a severe lesion high up enough to involve the petrosal. It should be possible to differentiate these two types. In the former case, lacrymation would still be present, *but not in the latter.* Such a test would however be complicated by the lacrymatory effect of the sympathetic, and possibly by the action of accessory lacrymal glands. Nevertheless a careful investigation of the tear flow in the various stages of facial palsy would seem to be a promising line of research.

The *prognosis* in crocodile tears is still doubtful. The syndrome can certainly persist for years, but I have reason to believe that it tends to diminish with the passage of time.

Treatment, if called for, is likely to prove difficult. The most likely line which occurs to me would be excision of the lacrymal gland. Apparently there are enough accessory lacrymals to prevent the development of xerosis. Alternative operations such as ligation of the lacrymal artery, or avulsion of the orbital nerve are likely to be more difficult and probably less satisfactory.

I am happy to tender thanks to the various colleagues who allowed me access to their files for the purpose of abstracting the cases on which this paper is founded.

[1] Brit. Med. Jour., 1934, ii., 1027.

King Edward VII. Hospital, Windsor.—Sir Gomer Berry, chairman of the hospital, and Lord Camrose have each given another £1000 towards the cost of the nurses' hostel. Their contributions, which now amount to £21,741, cover the whole cost of the hostel.

Edenbridge War Memorial Hospital.—A new block for consultation clinics and additional nurses' bedrooms is to be erected at this hospital and an appeal for funds is being made. The increased accommodation is much needed and the cost of building and equipment will be about £2700.

MEDICAL SOCIETIES

LIVERPOOL MEDICAL INSTITUTION

AT the December meeting of this institution, the vice-president, Mr. T. P. MCMURRAY, being in the chair, Dr. R. E. ROBERTS read a paper entitled

Radiology in Obstetrics

with special reference to its dependability.

Dr. Roberts considered the various questions which might be put to the radiologist by practising obstetricians, showed with lantern illustrations the ways in which the radiologist would endeavour to answer them, and discussed briefly the reliance which might be placed on the answers. His conclusions were: (1) Radiology in obstetrics has proved to be reliable in the diagnosis of pregnancy after the sixteenth week—sometimes earlier. (2) It gives information on the position and presentation, and on multiple pregnancy or fœtal abnormalities, which is more complete and reliable than that obtainable by any other diagnostic means. (3) In assessing the period of gestation where this is in doubt, radiology often gives information considerably more exact than that obtainable by clinical means. (4) Radiology, in skilful hands, gives precise help in assessing disproportion by demonstrating the size of the fœtal skull and the measurements of the maternal pelvis: the application of these cephalometric and pelvimetric data is, however, outside the province of the radiologist. (5) In the diagnosis of intra-uterine death, the radiological evidence is reliable if positive; if this condition be suspected a firm negative opinion can only be given if *repeated* examinations are made. (6) The X ray diagnosis of extra-uterine pregnancy is reliable if direct radiology be followed where necessary by the use of contrast media. (7) In the diagnosis of placenta prævia, two methods of employing contrast media are described: (*a*) Radiography after the injection of uroselectan into the amniotic sac. This method is open to the objection that the injection is almost certain to induce labour, and that in the radiograms the exact site of the filling defect due to the placenta is not always readily detected. (*b*) Radiography after the injection of an opaque solution into the bladder and demonstration of an increased gap between the fœtus and bladder in placenta prævia. This method is only reliable in the later months of pregnancy in cases of central placenta prævia where a central clot is excluded. Both these methods are in their infancy; insufficient data are available for a firm opinion as to their reliability.

In the discussion which followed, Dr. C. H. WALSH said he was pleased to note that Dr. Roberts only went so far as to claim that he could measure the pelvic brim by his special method, and thereafter leave the obstetrician to decide the mode of delivery. Dr. Walsh maintained that a radiogram of a moderate-sized hydrocephalus is extremely difficult to interpret, and that the final diagnosis rests on clinical findings. With regard to amniography, Dr. Walsh stated that after considerable experience of this method, which he instituted at Mill-road Infirmary, Liverpool, about three years ago, he had come to the conclusion that the introduction of uroselectan into the amniotic sac had a useful but limited place in obstetric diagnosis. It would outline the placental site and would demonstrate beyond doubt an abnormal fœtus. The disadvantages of the method were that from the radiological standpoint only an expert radiologist could interpret the findings, and that sooner or later labour would be induced by its application.

Dr. A. WINFIELD praised the pioneer work done by Dr. Roberts in X ray pelvimetry. Amniography, however, entailing insertion of a needle and risk of abortion, did not appear to be of much practical value, and might well shake the confidence of a patient who had only expected to have a picture taken.

Dr. F. J. BURKE said that in a series of cases he had found amniography safe and, as a diagnostic measure, accurate and helpful in the diagnosis of doubtful cases of placenta prævia. An advantage of the method was to make it possible to demonstrate abnormalities of the fœtus which might not be shown by direct radiography—e.g., meningocele. This was possible because fœtal soft parts as well as the bony skeleton were outlined. The method by which radio-opaque substance was injected into the bladder was not, in Dr. Burke's view, sufficiently accurate to be of real value. The diagnosis depended on a study of the distance between the posterior aspect of the bladder and the anterior aspect of the fœtal skull. To obtain a view in the correct plane demanded the most careful radiographic technique. It was difficult to see how it was possible to diagnose placenta prævia in this way unless the placenta occupied the anterior part of the lower uterine segment, and was actually interposed between the maternal bladder and the fœtal skull.

Mr. ST. GEORGE WILSON said that obstetricians did not need exact measurements of the bony pelvis and of the fœtal head. What they needed was the fœtus presenting by the head in utero at or about thirty-seven weeks, in order to decide whether the fœtus would pass through. It was important to remember the factor of uterine action. With regard to the evidence of placenta prævia, he had had a little experience of sodium iodide in the bladder, and he considered it was better than the amniography method in that it did not tend to start labour. However, he recognised that it was only of use in the central and marginal types of placenta prævia. In cases where the uterus was so tense that palpation was of very little use, diagnosis by means of X rays was very valuable.

Mr. R. KENNON read a paper entitled

The Kidney from the Surgeon's Point of View

He drew attention to the large number of urinary cases so indefinite as to require the attention both of surgeon and physician; some had frequency, others hæmaturia or renal colic, which could only be explained as renal congestion or mild nephritis. That normal urine (without casts) could be excreted in the presence of advanced nephritis was evident from occasional reports upon cases of "essential hæmaturia" which had been explored. Normal urine was common in the presence of multiple renal abscesses and perinephritic abscess. Infective nephritis had been overshadowed by the milder term pyelitis on slender pathological evidence. The possibility of acute nephritis of the abdominal type required continued emphasis to avoid a dangerous laparotomy. Subnormal gall-bladder function or a normal hypertonic stomach in ill-health at 60 might be the first indication of oncoming uræmia. Mr. Kennon commented on the swing from alkalinisation to the ketogenic diet and mandelic acid. Results were best when stasis was avoided. Delay to recognise when relief of tension by nephrotomy, &c., was

required produced disaster. Nephrectomy performed for essential hæmaturia, often in fear of early tuberculosis, was a serious matter. Renal carbuncle rarely called for nephrectomy. This operation carried a mortality of 7 per cent. for all types of case, and must frequently be preceded by drainage.

In the discussion which followed, Mr. COSBIE ROSS commented on the relative frequency with which cases of uræmia presented themselves as abdominal conditions, and quoted three such examples seen within a period of two years. One was admitted as a case of hæmatemesis, another as acute intestinal obstruction, and a third as pyloric obstruction. An interesting feature of the case of hæmatemesis was that the house surgeon stopped all fluids by mouth, with the result that the patient's condition became steadily worse; when the diagnosis was established, and forced diuresis instituted, rapid recovery ensured. All three cases were subsequently proved to be uræmic. Mr. Ross expressed his firm belief that as a means of estimating renal efficiency, the indigo-carmine test was superior to the estimation of urea in the urine collected by means of a ureteric catheter.

Dr. R. W. BROOKFIELD said that the classification of kidney disease was continually undergoing modification. The precise ætiology of many renal conditions was still obscure, and none were more baffling than those cases of undoubted renal pain which were unaccompanied by any demonstrable abnormality in kidney or ureter, and were relieved by renal sympathectomy. He thought it important that surgeons performing operations for calculus should give more than a passing thought to the possible existence of a generalised bone condition still in an early stage of development. In this connexion he referred to a patient with well-marked Paget's disease, recently seen, who had had a renal calculus removed some years earlier.

REVIEWS AND NOTICES OF BOOKS

The Parathyroids in Health and Disease

By DAVID H. SHELLING, B.Sc., M.D., The Johns Hopkins University and Hospital, Baltimore. London: Henry Kimpton. 1935. Pp. 335. 25*s*.

THIS is an up-to-date and accurate critical review of the anatomy, pathology, physiology, chemistry, and clinical medicine of the parathyroids. Dr. Shelling refers to the rapid progress which has been made in the past decade, especially in the chemical and clinical phases of the subject. He hopes that the monograph will appeal to the investigator as well as to the clinician, and disarms criticism by expressing his fears that the radiologist or surgeon may find the discussion on calcium and phosphorus metabolism somewhat lengthy and involved, that the chemist may find it too brief and sketchy, and that the pathologist may consider his subject neglected at the expense of chemistry or radiology. In order to compensate in part for these shortcomings a bibliography has been appended to each chapter, so that those who wish to pursue further any particular phase of the subject may know at once where to turn for the original source of information.

Under the heading Pathology of the Parathyroids variations are described in number, position, size, and weight. Quotations from six authors show that a good deal of confusion still exists on these simple matters. Dr. Shelling's descriptions and illustrations of the histology of parathyroid tumours are excellent. On this point he quotes in detail the writings of H. M. Turnbull who showed the variability of the histo-pathology of parathyroid tumours in hyperparathyroidism. Thus dark oxyphil cells, ballooned chief cells, or pale oxyphil cells may constitute the bulk of the tumour. In the discussion on the physiology of the parathyroids the effects of total parathyroidectomy and the pathogenesis of parathyroid tetany are discussed in detail. Making the most of the few recorded cases of idiopathic hypoparathyroidism Dr. Shelling quotes at length the work of W. Bauer, A. Marble, and D. Claflin on the metabolism of calcium and phosphorus in this rare condition. The biochemical effects of repeated frequent injections of the parathyroid hormone naturally receive much attention, and details are given of the effects on blood calcium, phosphorus, non-protein nitrogen, sodium chloride, and CO_2.

An illustration of the thorough method adopted throughout the work is the short section on psychosis in tetany, in which the observations of five authors are recorded. Tetany is discussed under three headings: (1) tetany dependent upon a reduction in the total concentration or an inactivation of part of the calcium in the serum; (2) tetany due to intoxications; (3) tetany due to magnesium deprivation. Table III. gives a useful summary of the differential diagnosis of the various forms of tetany. The long section entitled Hyperparathyroidism and Osteitis Fibrosa exemplifies the good judgment of the author. He gives due consideration not only to skeletal signs and symptoms but also to the four other symptom groups which he calls general, urinary, metastatic, and metabolic. Priority is properly allocated to F. Mandl in Europe and J. C. Aub in America for appreciation of the true significance of hyperfunction of the parathyroids. The differential diagnosis of hyperparathyroidism is discussed under the headings osteomalacia, Paget's disease, renal rickets, osteoporosis, localised lesions in the bones, generalised xanthomatosis of bones, secondary carcinomatosis, leukæmia, Hodgkin's disease, erythroblastic anæmia, and osteogenesis imperfecta. In the critical review of the effects of parathyroidectomy the work of E. D. Churchill and O. Cope forms the basis for discussion. It is disappointing in this section to find such a sketchy description of the bones in generalised osteitis fibrosa; a footnote refers the reader to the work of F. von Recklinghausen and H. M. Turnbull on this subject. A whole chapter is devoted to the relation of the parathyroids to vitamin D, and the last chapter deals justly with those who misuse the parathyroid hormone in therapeutics. Useful appendices supply details as to meals of low calcium and low phosphorus content. The book is attractively printed, and the illustrations, especially those of radiograms and histological sections, are excellent.

We heartily commend this book and wish it the success it deserves.

A Textbook of Bacteriology

By THURMAN B. RICE, A.M., M.D., Professor of Bacteriology and Public Health at the Indiana University School of Medicine. London: W. B. Saunders Co., Ltd. 1935. Pp. 551. 21*s*.

THIS text-book covers the ground required by the average student of medicine. The author has obviously tried to present the subject in the simplest

possible fashion, and at times his search for simplicity has led him into jejune and popular methods of expression which are undesirable in a text-book. For example, such a statement as "by all means, hands should be kept out of the mouth and should be washed several times a day" may represent laudable doctrine but is best omitted from a 500-page work on bacteriology. On the whole the information given in the book is accurate, though the definition given of a unit of diphtheria antitoxin as "the amount of antitoxin that will neutralise 100 M.L.D. of freshly made diphtheria toxin" is almost enough to disqualify an author from being regarded as a serious exponent of immunology. Chapters on immunity, filtrable viruses, and protozoa give completeness to a book which, if in no way inspired, provides a serviceable enough introduction to bacteriology.

Antenatal and Postnatal Care

By FRANCIS J. BROWNE, M.D. Aberd., D.Sc., F.R.C.S. Edin., F.C.O.G., Professor of Obstetrics and Gynæcology, University of London; Director of the Obstetric Unit and Obstetric Surgeon, University College Hospital, London. London: J. and A. Churchill Ltd. 1935. Pp. 480. 15*s*.

HIS sense of the growing importance of antenatal and postnatal care and the inadequacy of its representation in obstetric literature has spurred Prof. Browne to write a book which really meets a need. He starts with a welcome account of development of antenatal care, tracing its history back for four hundred years, and then proceeds logically to consider the management of the patient from her first visit to ascertain whether or not she is pregnant. We observe that he advises a Wassermann test in every case. Prof. Browne explains what importance is attached to an accurate history of past pregnancies and labours and goes on to say that this history "is usually obtained by a senior nurse." This may be all very well in hospitals and clinics, but since the book is presumably designed for practitioners and students we suggest that in a future edition this section might with advantage be enlarged to include a note on the special points in the past history that may or may not be of significance. The paragraphs upon diet in pregnancy are suggestive, but again not sufficiently detailed. Dr. Grantley Dick Read is responsible for Chapter VI. entitled The Influence of the Emotions upon Pregnancy and Parturition. It is mainly concerned with parturition, and an expansion of the subject matter to fit the title would be welcome; the section on the mental outlook of the midwife is excellent.

The difficulties and pitfalls of pelvic and fœtal mensuration are fully discussed and a vivid picture is drawn of the problems associated with minor degrees of disproportion. The treatment of abnormal presentations and positions is clearly set out; more attention might have been directed to the breech presentation as a possible warning of other and more dangerous complications. The chapters on antepartum hæmorrhage, the toxæmias, and the interrelationship of pregnancy with various diseases and ailments are on sound orthodox lines.

Only 9 of the 480 pages are allotted to postnatal care; there must be a good deal more that could usefully be said on this subject by such an authority as Prof. Browne. Such subjects as the medicinal induction of labour, specialised diets, and the conduct and scope of antenatal clinics are helpfully discussed in appendices, and a large bibliography completes the work.

If occasionally emphasis seems to be laid on the detection of the abnormal, rather than on the preservation of the normal, it is because the latter aspect of antenatal work is an attitude to be cultivated rather than a discipline to be taught. Prof. Browne certainly conveys this attitude better than do most writers on antenatal care and his book should be of the greatest interest and assistance to all engaged in the practice of obstetrics.

1. Demonstrations of Physical Signs in Clinical Surgery

Fifth edition, revised. By HAMILTON BAILEY, F.R.C.S., Surgeon, Royal Northern Hospital, London. Bristol: John Wright and Sons, Ltd.; London: Simpkin Marshall. 1935. Pp. 287. 21*s*.

2. An Introduction to Surgery

Third edition. By RUTHERFORD MORISON, M.D., F.R.C.S., Emeritus Professor of Surgery, Durham University; and CHARLES F. M. SAINT, C.B.E., M.D., F.R.C.S., Professor of Surgery, Cape Town University, S.A. Same publishers. 1935. Pp. 367. 15*s*.

3. The Early Diagnosis of Malignant Disease

By GEOFFREY KEYNES, M.D. Cantab., F.R.C.S. Eng., Assistant Surgeon to St. Bartholomew's Hospital; Surgeon to Mount Vernon Hospital. London: John Bale, Sons and Danielsson, Ltd. 1935. Pp. 70. 2*s*. 6*d*.

1. This admirable book has been still further improved in its new and revised edition. It is a book which every student should read and keep by him. The steps of physical examination are clearly and simply set out and the work is beautifully illustrated.

2. A new edition of this book, originally written many years ago, will be welcomed by student and teacher alike. It fulfils well its purpose, for it supplies an introduction to surgery which can be understood by the novice to clinical work. The method of presentation is simple and effective—altogether a most satisfying work.

3. In this small book the main facts which enter into the diagnosis of malignant disease in different parts of the body are set out clearly and readably, but not in very great detail. When the reader gets over a feeling of slight surprise that its gifted author should have devoted his energies to the compilation of a collection of diagnostic paragraphs interspersed with a few illustrative clinical records he will perceive that these are presented more vividly and with greater precision than the corresponding paragraphs scattered through surgical text-books.

Praktische Anatomie

By Dr. T. VON LANZ, Professor of Anatomy in the University of Munich; and Dr. W. WACHSMUTH, Privatdozent for Surgery in the University of Bonn. Vol. I., Part III. *The Arm*. Berlin: Julius Springer. 1935. Pp. 276. R.M.26.

THE title of this book is somewhat misleading to the English reader, to whom a "practical anatomy" book is a dissection manual. The work is actually concerned with the practical application of anatomy in clinical matters. The authors start with the sound precept that anatomical knowledge is the basis of all correct physical procedure in clinical work; they have produced an interesting and fairly full account of the anatomy of the arm. We would like to see more stress laid on the function of the muscles immediately surrounding the shoulder-joint when

dislocations at this articulation are under consideration. The fact that the head of the radius is always in contact with the humerus constitutes an obstacle to the blind acceptance of the statement here made that shocks passed from the hand to the radius are transmitted by the interosseous membrane to the ulna. The illustrations are semi-schematic and clear; numerous figures representing persons turning their limbs about within hollow spheres marked longitudinally and latitudinally in degrees are of the nature of an acquired taste, but will not prevent—even if they do not encourage—an appreciative reception of this effort to serve the surgical practitioner in his work.

The Stomach and Duodenum

By GEORGE B. EUSTERMAN, M.D., F.A.C.P., and DONALD C. BALFOUR, M.D. Tor., F.A.C.S., F.R.A.C.S., and Members of the Staff, The Mayo Clinic and the Mayo Foundation for Medical Education and Research. London: W. B. Saunders Co., Ltd. 1935. Pp. 958. 45s.

THE authors of this book after surveying the ætiology and physiology of the stomach proceed to describe the useful methods of examination, and discuss the significance of symptoms and the various diseases of the stomach and duodenum. Special chapters are devoted to such subjects as anæsthesia for gastric operations and the medical treatment of inoperable cancer of the stomach, anæmia following operations on the stomach, and other complications which occur after operations on that organ or the duodenum. Chapters of great interest are devoted to such rarities as diaphragmatic hernia, hypertrophic pyloric stenosis in adults, non-malignant tumours of the duodenum, sarcoma of the stomach, and paraduodenal hernia.

The Mayo Clinic stands in the eyes of the medical world as a great surgical institution and it is perhaps scarcely just to criticise this work on the grounds that it seems to show a strong surgical bias. But as the name of Dr. Eusterman is placed first amongst the authors, and medical education and research are mentioned prominently in the early pages of the volume, the prominence throughout the book of surgery at the expense of medicine is a little disappointing. The faint enthusiasm towards medical treatment must leave the average reader with the impression that the therapeutics of every gastric disease consists in the successful application of surgery in order to terminate an illness in which medical treatment has been laudably but ineffectively applied for a considerable period. This surgical bias is to be found also in the suggestion which is made again and again that the risk of malignant change is a strong reason against the medical treatment of gastric ulcer. Thus in Chapter IV. Dr. MacCarty begins by saying that carcinoma is not only the most frequent gastric lesion but it is the most frequent form of cancer found in the human body, and proceeds to state that he has never seen a carcinoma arising from an intact mucosa and that the majority of cancers occur in association with chronic ulceration. Yet in Chapter XVI., which is devoted to the question of carcinomatous transformation of gastric ulcer, we are told that the frequency with which this change occurs is "not of primary importance," and an editorial article is quoted with approval which states "the question of the percentage of gastric ulcers becoming malignant is purely academic." The authors admit that the majority of gastric ulcers are actually benign and will remain so, but yet produce a series of hair-raising arguments sufficient to convince the average reader that extensive resection is a wise precaution whenever an X ray reveals the presence of an ulcer in the stomach.

Even when the treatment of duodenal ulcer is under discussion we can find nothing but pessimism in the authors' outlook towards medical treatment. They admit that the information available is too slender to provide a final, authoritative answer to a question on the prognosis of duodenal ulcer treated medically. As the result of past experience they have arrived at the conclusion, "which is reflected in the attitude of life insurance companies towards patients who have ulcers," that such patients, as have not been operated on, are substandard risks. It may be comforting to the physicians who endorsed this statement that in England at any rate a man or woman with a past history of duodenal ulcer which has responded well to medical treatment for some years without relapse is more readily acceptable by life insurance companies than a patient in an equally happy condition who has undergone an operation on the stomach.

REPORTS AND ANALYSES

RUSSIAN IMPERIAL STOUT

(BARCLAY PERKINS AND CO., LTD., LONDON, S.E.)

THIS well-known stout before the war was exported to Russia. The sample which was analysed had been 21 months in bottle and had a very full and matured taste. When analysed the following results were obtained:—

Present gravity	1024·04
Alcohol by volume	10·42 per cent.
Equivalent to proof spirit	18·20 ,,
Matters in solution	9·66 ,,
These include—	
Maltose	2·53 ,,
Dextrin	3·22 ,,
Other carbohydrates, hop extract, &c.	2·41 ,,
Protein	0·72 ,,
Acidity (as lactic acid)	0·30 ,,
Mineral matter	0·48 ,,
(including phosphoric acid)	0·134 ,,

This stout on account of its strength and full maturity can be regarded as one of the finest products of the English brewing industry. Its condition—i.e., content of carbonic acid gas—was not excessive, and as a beverage it is most agreeable to the palate.

MONBERNO MEDICATED WINE

(PREPARED BY THE CISTERCIAN MONKS OF MOUNT ST. BERNARD ABBEY, CHARNWOOD FOREST, LEICESTERSHIRE)

This red wine has an agreeable flavour and bouquet which is suggestive of port. When analysed the following results were obtained:—

Alcohol	17·5 per cent. by volume.
Equivalent to proof spirit	30·5 ,,
Volatile acidity (as acetic acid)	0·025 ,,
Fixed acidity (as tartaric acid)	0·42 ,,
Total solids	15·0 ,,
Consisting of—	
Sugar	12·1 ,,
Ash	0·46 ,,
Phosphoric acid	0·10 ,,
Meat extract	1·20 ,,
Other extractives	1·24 ,,

The claim that this wine contains meat and other extractives is supported.

THE LANCET

LONDON: SATURDAY, JANUARY 4, 1936

THE MARRIAGE OF PUBLIC HEALTH AND AGRICULTURE

THE phrase is Mr. BRUCE'S. He was speaking of the wastefulness of widespread malnutrition at a time when farmers long to produce more crops; he was pointing out that agriculture and public health have one great need in common; and he was urging the governments of the world to divert their subsidies from schemes for restricting production to schemes for enlarging consumption. Here in England this policy finds one of its best exponents in a member of our profession who is also in close touch with farming, Sir JOHN ORR of the Rowett Institute at Aberdeen. In his address to the British Association last September he admitted that price-raising methods such as quotas and tariffs have saved British agriculture from the full effects of the world economic crisis, but maintained that they can be justified only as emergency measures. At a time, he said, when there is a so-called glut of all kinds of food, the continued existence of diseases due to malnutrition shocks the public conscience, and public opinion forces an increase of the already heavy expenditure on social services in an endeavour to get them eliminated. Cheaper food would reduce the cost of such services, for it means less poverty and less disease due to poverty; and Sir JOHN went on to demonstrate that agriculture, as much as public health, stands to gain from an expensive programme. Inquiries jointly made by the Rowett Institute and the Market Supply Commission show that consumption of the "protective" foods—milk, eggs, fruit, and vegetables—rises uniformly with income, and that generally speaking it is not until we reach families with about £1 a week per person that the diet, according to modern standards, is adequate for maintaining health. At present some 20 million of the population are below this scale and if everyone in the country were brought up to the £1 5*s*. scale, which probably represents an optimum, the market for food would be 20 per cent. larger. He calculates that if we all had as much food as we ought the percentage increases in consumption would be: milk 42, butter 27, eggs 28, fruit and vegetables 53—which "gives an indication of the limit to which agriculture could be developed in this country without reducing imports and therefore without prejudicing our export trade or the interests of our overseas investments." The Bishop Auckland potato experiment, in which unemployed men bought their potatoes direct from a depôt at 4*d*. instead of 7*d*. a stone, showed that there is an ample market for food at lower prices and indicated one way in which these prices can be attained. The better organisation of distribution by marketing boards could, in itself, lower retail prices, and the remaining difference between the price the public can pay and the price the farmer must charge should be made good, in Sir JOHN ORR'S opinion, by direct subsidies to these boards from the State—subsidies to be regarded as more in the interests of public health than of agriculture. "All the money going to the farmer flows back immediately to the towns, invigorates industries and reduces unemployment. None of it is lost to the country... The next five years should be devoted to a great constructive policy, based on increased consumption and better utilisation of our wealth, a policy designed to bring about a prosperous agriculture, a better fed people, and increased internal trade."

A voice crying in the wilderness? No. For when Mr. BOOTHBY brought forward some of these arguments in the debate on the Address last month the Government spokesman, Lord EUSTACE PERCY, took pains to show that the investigations on which Sir JOHN ORR'S conclusions are founded were made at the instance of the Government itself, and published in order to awaken public attention to the need for, and possibilities of, a policy of nutrition. Lord DE LA WARR, as Parliamentary Secretary to the Ministry of Agriculture, told the League of Nations' Assembly in September that it is not enough to resist a policy of restriction; something more positive is needed—namely, deliberate action. On Dec. 18th Lord EUSTACE PERCY, receiving a deputation from the Children's Minimum Committee, said that a broad nutrition policy must be one of the main aims of social administration in the immediate future; indeed, he went further and declared that on the main issues there was no conflict between the views of the Government and those of the deputation. If this is true it suggests a definite change of front—a determination, now that trade is recovering, to think in terms of permanent social advantage rather than the requirements of crisis. For the deputation's memorandum set out clearly their demand for a more positive approach to the problem of nutrition, their discontent with the abandoned scales of the Unemployment Assistance Board, their anxiety about the painful reports that come from distressed areas and distressed homes, and their belief that "a great deal more can be done immediately by a more generous development of existing services to safeguard and improve the health of the two sections of the community for whom proper nutrition is of supreme importance—children, and mothers during the child-bearing period." The sharpest edge of the depression, they said, is falling on families with young children, and they outlined schemes by which this national evil can at least be mitigated. Lord EUSTACE PERCY was right when he replied that

a really broad policy can hardly be based on attempts to deal merely with cases of poverty, and that its most important aim must be rather to promote the establishment of sound normal standards of nutrition and physical fitness. But he might equally well have said that such a policy must be based on the recognition that proper feeding is the first necessity for national health—a necessity more urgent and compelling even than good housing or the control of infection or any other of our hygienic aims. At present we are wasting our agricultural resources and we are wasting our human material. In Sir JOHN ORR'S words, we need a national food policy, into which both agricultural and public health interests can be fitted and reconciled.

The science of nutrition has shown the way to a more economical economy, to a more tolerable state of society. It has revealed deficiency diseases; it has described the means whereby they can and must be prevented.[1] But we shall be very much mistaken if we look on this science as merely the analysis of starvation; we should think also of the constructive contribution it may make to human progress. Dr. JAMES MCLESTER took this as his theme for the presidential address [2] he gave to the American and Canadian Medical Associations last summer, when he spoke of the highly significant discovery that under certain circumstances an animal's life may be greatly improved by the addition of appropriate foods to a diet previously thought satisfactory. In twenty years, he said, OSBORNE and MENDEL were able to treble the growth-rate and double the standard weight of their albino rats; they produced what was in fact a new species, simply by intelligent alteration of the rations. Can the same thing be done for man? The Chinese in Hawaii, the Japanese in San Francisco, grow larger than their compatriots in China and Japan. In this country F. G. PARSONS believes that hygiene and better food have raised the height of the upper classes, while H. H. BASHFORD reports that Post Office messengers get bigger (though not necessarily brighter) from year to year. Where must the process stop? "The mere survival of a community," Sir GOWLAND HOPKINS has remarked, "is too often taken as proof that the nutrition of its constituent individuals is adequate"; but "the community, while managing to survive, may yet be functioning at levels far below those possible to its innate capacities." In other words, MCLESTER says, adequate and optimum are not synonymous, and it may be possible, through improved nutrition alone, to bring mankind to a higher level of physical development—to a larger stature, greater vigour, increased longevity, and a higher level of cultural attainment. Ultimately this is a problem of education and of government; and the first step towards solving it is to ensure that the marriage now arranged between public health and agriculture shall shortly take place.

[1] See the Report on the Physiological Bases of Nutrition drawn up by the Technical Commission of the Health Committee of the League of Nations, p. 1434, reproduced in our columns on Dec. 21st, 1935.
[2] Jour. Amer. Med. Assoc., 1935, civ., 2144.

MORE ABOUT INFLUENZA

AN important communication by C. H. ANDREWES, P. P. LAIDLAW, and WILSON SMITH marks a further advance in our knowledge of influenza.[1] Ever since this team of workers first announced that they had succeeded in isolating a filtrable virus from cases of epidemic influenza, and advanced reasons for thinking it to be the prime cause of this disease,[2] their findings in subsequent outbreaks have been eagerly awaited. Would it prove that epidemic influenza was due to one and the same virus the world over or would more than one ætiological agent be found? And what about sporadic influenza; would this also turn out to be a virus disease? It was clear from Sir PATRICK LAIDLAW'S Linacre lecture [3] that a virus, similar to those recovered from influenza in 1933, had been encountered during 1934 and 1935, but it is only now that the full details of this work have been forthcoming. The winter of 1933–34 saw little influenza in London, but from a small outbreak in March, 1934, a fresh strain of virus was isolated. The next winter, however, proved more propitious for the investigations and eight new strains were obtained, six from an outbreak amongst the troops in Dover and Shorncliffe and two from cases which occurred in London in the early months of 1935. All these new strains have been shown to be identical with those obtained in 1933.

To these findings must be added evidence coming from other parts of the world. In America T. FRANCIS,[4] of the Rockefeller Institute, has isolated several strains of virus from cases of influenza and shown them to be the same as the English strains. Further, the Hampstead workers have had the opportunity of examining two of these American strains and of confirming the conclusion arrived at by FRANCIS. A recent paper by F. M. BURNET [5] reports the isolation of a strain of virus from cases of epidemic influenza in Australia; this also was shown to be similar to the English ones. There is thus good reason for thinking that epidemic influenza, wherever it occurs, has the same virus for its prime cause. The causation of sporadic influenza, however, still remains unsolved. Material from 12 such cases has been examined for the presence of virus by the Hampstead team, with completely negative results; and negative also were the results obtained with nasopharyngeal washings from six cases of a type of upper respiratory infection prevalent in the Woolwich garrison in the early months of 1935 and diagnosed clinically as influenza. In the past many have doubted whether all cases labelled influenza constituted an entity and these findings tend to confirm the suspicion.

This latest paper from the National Institute for Medical Research [1] records two disappointments. Attempts were made to infect human volunteers

[1] Andrewes, C. H., Laidlaw, P. P., and Smith, W.: Brit. Jour. Exp. Path., 1935, xvi., 566.
[2] THE LANCET, 1933, ii., 16.
[3] Ibid., 1935, i., 1118.
[4] Proc. Soc. Exp. Biol. N.Y., 1935, xxxii., 1172.
[5] Med. Jour. Australia, 1935, ii., 651.

with the influenza virus, but without success. It should be pointed out, however, that only two volunteers were inoculated and that the authors advance very reasonable explanations for this failure, so that these negative results do not really mean very much. The second disappointment concerns the possibility of infecting mice direct from man. When about 18 months ago ANDREWES, LAIDLAW, and SMITH [6] reported the successful inoculation of mice with ferret-passaged influenza virus, it was hoped that it would be possible to infect mice direct from man and thus bring influenza research within the reach of laboratories without facilities for keeping ferrets. Unfortunately this hope has not been realised. Human material which took readily in ferrets has regularly failed to infect mice; only after ferret-passage does the virus become infective for the mouse. A further piece of work calls for mention. WILSON SMITH [7] has cultivated influenza virus. He tried two methods: (1) cultivation in the developing egg, which has been used successfully with a number of viruses, and (2) cultivation in a simple medium consisting of minced chick embryo tissue and Tyrode's solution. The latter method proved by far the most successful and should be of use in providing suitable material for immunisation purposes.

ARTERIAL EMBOLECTOMY

REPORTS of arterial embolectomy by British surgeons owe their chief interest to the rarity of the operation in this country. Sweden, on the other hand, has a larger experience of it, and J. P. STRÖMBECK [8] is able to report the late results in 61 cases in which the circulation was restored. These are the successes out of a total of 327. The investigation covers the years 1913–32 and, as it was made in 1934, at least one and a half years had elapsed since the last operation. The immediate mortality in the 327 cases was, of course, considerable, and in STRÖMBECK'S words 207 (63 per cent.) were "discharged from hospital dead." But these deaths were by no means always directly attributable to the operation, since the disease causing the embolism—most often cardiac—is often fatal in itself. Of the 37 per cent. surviving operation, 18 per cent. required subsequent amputation, while the other 19 per cent. were discharged alive, with circulation restored; and it is with these 61 cases that STRÖMBECK'S paper is chiefly concerned.

Only one of the patients was not traced. Of the others, 49 were alive after three years; 43 after five years; and 16 after ten years. At the time of the investigation 41 had already died, the cause of death in all but 2 having apparently a direct connexion with the disease originally causing the embolism. In 28 the cause of death is given as heart failure or as chronic myocarditis or cardiosclerosis; other complications of the basic heart affection were hemiplegia, renal infarcts, cerebral thrombosis, and chronic nephritis. The after-history of the patients also revealed a tendency to cerebral circulatory disturbances and to repeated embolism. STRÖMBECK sums up the prognosis after successful embolectomy by saying that, as regards expectation of life, it is essentially the prognosis of the underlying cardiac disease. Further inquiry into the working capacity after operation, and into the local damage to the part of the body affected, showed that the proportion of patients getting back to something like a good working capacity was definitely greater in those that lived longest. Of those who died within three years, at least 70 per cent. never got back to work, and many of them were bedridden. The local results tended to be good; small areas of necrosis, sensory disturbances, and peroneal paresis were reported in one-eighth of the cases.

Mr. GEOFFREY JEFFERSON'S paper read at the annual meeting of the British Medical Association in 1934 stimulated interest in embolectomy, and our issue of last Nov. 30th contained two records of successful operation, together with useful suggestions about technique. Mr. VICTOR RIDDELL pointed to the danger of secondary thrombosis at the site of an embolectomy, and proposed that the artery should be ligatured, above and below the incision through its wall, in cases where the collateral circulation, restored by unblocking of the lumen at the bifurcation of the vessel, appeared to be efficient. Mr. G. R. GIRDLESTONE believed that an attempt might often be made to massage the clot from its situation at the bifurcation of an artery into the less important branch—a plan which would have the advantage of avoiding injury to the intima, and so of lessening the risk of subsequent secondary thrombosis. This suggestion was also made by JEFFERSON. The importance of securing a lasting restoration of the circulation is obvious, and STRÖMBECK describes this as the only means by which we can hope to lower the present high mortality from the operation. A secondary amputation, where embolectomy fails, involves great immediate danger. The only other method available for lowering the mortality is to choose the patients who present the best operative risk, but any improvement in results thus attained is of course more apparent than real. It is clear, however, from STRÖMBECK'S valuable study of after-histories that no very cheerful prognosis is justified as regards restoration to normal life or length of survival.

CO-EDUCATION

OF the human race as a whole at least a half and probably more are co-educated, yet co-education is often spoken of as a difficult problem. It becomes a difficulty under two conditions: (1) when it is not simply a matter of boys and girls learning together, but also of spending most of their leisure together; (2) when co-education is not the usual custom of the community. In England both of these conditions are present. Co-education in day-schools is not the problem that it is in boarding-schools, and in the latter there are further complications associated with

[6] THE LANCET, 1934, ii., 859.
[7] Brit. Jour. Exp. Path., 1935, xvi., 508.
[8] Acta chir. Scand., 1935, xi., 229.

the social class which sends its children to these establishments. Those whose playground is the street, those who have no special play-room at home, are in general, on account of their home experience, less likely to find co-education a personal difficulty, and their parents will in general view it with less alarm—and see fewer dangers—than those who live in an atmosphere of greater, even perhaps too great, exclusiveness.

Boarding-school co-education is in England inevitably regarded as different from ordinary schooling; the sex-segregated schools are thought of as normal, the others as a little peculiar. Under these circumstances it is difficult to exclude the atmosphere of an experimental undertaking, even though the schools in question may have been founded for a long time, because each generation of parents and teachers has to step out of the traditional groove when deciding on this type of school. Parents and staff are apt to become self-conscious regarding co-education, and self-consciousness in the face of a sexual question never helps towards clearness of judgment. The self-consciousness is attributable at least in part to the sense of danger, real or imagined, which attaches to an experimental situation, and is not perhaps quite unrelated to the self-consciousness and the heightened expectancy which precedes the contact of the sexes in later years; at any rate, there are similarities. Whatever may be the real dangers (we must not underestimate the prudence not to speak of the fears of adolescents), the imagined ones in the minds of adults sometimes assume the vividness and even the terminology of actual illicit sexual relations. In addition there is a special sociological terror, the assumption being that pleasure in associating with the opposite sex away from the guarding eye of an adult will, if indulged prematurely (i.e., before the person is economically able to support a home), lead to an insidious dissolution of *all* the standards of conduct and character acquired in the home, and is therefore destructive to the culture which it is hoped that the next generation will maintain, if need be with the same amount of effort expended by the last.

A discussion of co-education that avoids these questions, like the "straight talks" to the young, goes straight past the difficulties. The problem needs simplification, and the first step is to look directly at the psycho-sexual life of the child and adolescent. Co-education was the topic of the December (an "open") meeting of the Medical Section of the British Psychological Society, and the observations of medical psychologists were presented by Dr. LAURA HUTTON. The first fact to emerge is that there is not one but three problems of co-education, corresponding to three phases of psycho-sexual development. The first stage covers approximately the years from six to eleven, and is characterised by a relatively slight degree of sexual feelings, boys and girls tend to treat each other alike. They play and work together and don't think twice about it. The second stage is from eleven to fourteen, in it there is a prepubertal awakening of interest, but at the same time an affectation of despising or ostentatiously avoiding the opposite sex. This contumely is not genuine and partly arises from a secret shame of sexual feelings, and a dread lest anyone should detect their presence. The scorn is a mask for anxieties which though not objective cannot be neglected. The third stage is that of puberty proper; it begins with a secret acknowledgment of the mutual attraction, but now the defensive aggressive attitude is directed not to the opposite sex as a whole, but to any special and public manifestation of the attraction. When there is an opportunity for the sexes to mix during the third phase there is a period of more rational and quiet friendships, to give place later to deeper feelings directed specially to particular individuals. To speak, therefore, of co-education without considering the changes of the psycho-sexual impulse in the pupils is likely to lead to a drift into meaningless generalities.

A recognition of these changes may illuminate also the special problems of the children in sex-segregated schools—viz., a narrowing of experience at a time when it should broaden, and a tendency to remain at one of the defensive (but normally transitory) positions already mentioned. For example, it is sometimes suggested that the sex-segregated schools are more likely to foster homosexual tendencies than the co-educational, since in the latter (if there is not overt or implicit intimidation) the pupils have opportunity for discovering their feelings for the opposite sex. Investigation shows that homosexual practices in schools do not as a rule have permanently serious consequences. There is however a less transitory kind of homosexual interest which is so deep rooted that it would not be influenced materially by the opportunity afforded by co-education. It is unwise to organise education about a particular sexual problem.

The whole matter requires more investigation; as yet a parent has no criteria to help him decide whether to choose a co-educational or sex-segregated school. The absence of criteria is partly due to the difficulty of the subject, partly to the fact that the child's schooling is one of the last and not least cherished fields for the enforcement of parental authority, and a kind of last ditch in which parental discipline puts up its vicarious fight. Education should not get too much involved in these struggles or it becomes a forcing-ground for faddism, and since there is so much for the pupil to master intellectually in these busy, brainy days it is undesirable for his school years to be burdened by emotionally toned problems of school organisation; those who think the pupils are not keen critics of educational theoreticians know nothing of the facts. So for the sake of pupils and schools alike, there is need for a clearer statement of those matters.

The medical psychologists give us another clinical observation which speaks neither for nor against co-education or sex-segregated schools, but which should do something to dispel alarmist

views as to the dangers of "tampering with education." It appears that character and a *Weltanschauung* are formed in the pre-school period; there is little need to fear that even the most experimental of schools will produce freaks in those having no strong tendency to freakishness; a good school helps the child to develop a strong interest in the people and things (and occasionally even in "problems") which he finds around him. If the school is to be adapted to the potentialities of the child as well as to the need for continuity of culture in the community, whether the decision be ultimately in favour of co-education or sex segregation, the basis for a wise decision must be a deeper study of the psycho-sexual development of the child.

ANNOTATIONS

THE ACTION OF DUST ON THE TISSUES

IT is now generally agreed that the essential process in the development of pneumoconiosis is the solution of the inhaled dust particles; the mere mechanical irritation of accumulated insoluble mineral particles is not sufficient to produce that degree of fibrosis which we associate with silicosis. This conception of the silicotic process is largely due to observations on the tissue reactions which result when silica and other minerals are introduced into other parts of the body than the lung. L. U. Gardner and D. E. Cummins [1] have used the intravenous route and have studied the behaviour of silica introduced in this way into the liver and the spleen. E. H. Kettle [2] observed the behaviour of dusts injected into the subcutaneous tissues, and J. W. Miller and R. R. Sayers [3] investigated the results of injecting dusts into the peritoneal cavity. These observations showed fairly clearly that whereas certain dusts caused a very definite tissue reaction, others appeared practically inert, and it at once became apparent that here was a method which should make it possible to determine whether any particular dust might be expected to produce pneumoconiosis if inhaled into the lungs. In a recent publication [4] Miller and Sayers have carried the matter still further. Using the peritoneum as their test tissue they have examined 16 different dusts and have found that they may be divided into three clear-cut groups.

In the first or absorptive group the dust was absorbed or disappeared without causing any gross visible damage; calcite, limestone, precipitated calcium carbonate, gypsum, and portland cement fell into this group. In the second or proliferative group—pure crystalline quartz (two samples) and a highly siliceous chert—the dust initiated cellular proliferation followed by fibrosis and retrograde changes. And in the third, inert group, anthracite coal (two samples), bituminous coal (two samples), hæmatile, carborundum, precipitator ash, and soapstone, the dust remained inert in the tissues, neither being absorbed nor causing gross proliferation. Microscopic examination of the lesions demonstrates the essential differences between them. In the early stages of the absorptive group reactions there is a little necrosis, possibly traumatic, but this rapidly disappears, and only a very minor degree of fibrosis results. In the proliferative group both necrosis and fibrosis tend to be progressive. In the inert group there is never any necrosis and fibrosis is always slight in amount. The authors do not refer to the secondary reactions in the associated lymph nodes to which Kettle [5] attaches considerable importance, but from the observations accompanying their article the lesions they have produced seem to be sufficiently distinctive to justify their claims that the pneumoconiotic potentialities of a dust may be estimated by their technique in as short a period as 60 days.

[1] Amer. Jour. Path., 1933, ix., 751.
[2] Jour. of Path. and Bact., 1932, xxxv., 395.
[3] Jour. Amer. Med. Assoc., 1934, ciii., 907.
[4] Public Health Reports, U.S. Pub. Health Service, 1935, l. 1619.
[5] THE LANCET, 1934, i., 889.

ACID IN THE STOMACH

EXACTLY three years ago we commented on an aspect of acid secretion which promised to have important bearings on the causation and treatment of gastric diseases as well as of certain general disorders. About this time F. L. Apperly and M. C. Crabtree had shown that the concentration of the gastric hydrochloric acid during a fractional test-meal seems to depend on the bicarbonate content of the blood-plasma; in other words, that the secretion of acid is determined more by conditions of the blood than by what is going on inside the stomach itself. Further studies on the same lines are reported in our present issue in which Prof. Apperly continues his interesting inquiry into the significance of gastric acidity. In bringing together those causes which lead to variations in the plasma CO_2 it is seen that a number of diverse conditions have at least one common factor. For example, direct loss of carbon dioxide may be produced by the over-breathing which occurs in a hot bath, in some fevers, and at high altitudes; it may also be secondary to the formation of lactic acid after severe exercise or to the ingestion of ammonium chloride. There are records showing that in all these conditions gastric acidity is low; likewise it is said to be reduced in the anoxæmia associated with hæmorrhage. Apperly's experiments suggest a further step in his argument—namely, that anoxæmia is not the first consideration, but that hæmoglobin variations in the blood (upon which anoxæmia largely depends) may be correlated with changes in gastric acidity. Thus he goes so far as to assume that when the hæmoglobin content of the blood falls to about two-thirds of its normal value gastric acidity disappears, and in patients with post-hæmorrhagic anæmia he has found that this in fact happens. The idea that the relationship is as simple as this arouses doubts, however, as well as interesting speculations. It seems to be established that in some cases at least achlorhydria often precedes anæmia by long periods, and that some gastric abnormality is the predisposing cause of the blood changes; and though this does not exclude the possibility that in others the gastric anacidity is secondary to the anæmia, it will often be hard to find a primary cause of the initial blood changes. Further, there are undoubtedly some patients in whom the hæmoglobin in the blood is not above 50 per cent., but whose gastric acidity is little if at all below normal. But even if his conclusions are not entirely acceptable Prof. Apperly's paper is valuable because it brings once more to

the front the non-gastric factors in the regulation of the acidity of the stomach and emphasises the importance of thinking of the general condition of the patient with gastric disorders and not merely of diet and treatment with acids and alkalis. His demonstration of the action of warmth in reducing gastric acidity shows the importance of general measures in the management of conditions associated with hyperchlorhydria, and the well-known effect of fevers in causing anacidity may possibly explain some of the benefit that apparently follows the use of protein substances by injection in cases of peptic ulcer.

UNEXPECTED RICKETS AND SCURVY

Dr. Alan Moncrieff shocked the Physiological Society the other day with a communication entitled "rickets on a diet with adequate cod-liver oil, and scurvy on a diet containing adequate orange juice." The case-records now published [1] illustrate, as he says, difficulties in the simple ætiology assumed for the deficiency diseases. The rickety child, 17 months old, had been artificially fed from birth on a rational diet, supplemented by cod-liver oil in doses of one or two drachms daily or by "another preparation reputed to be 25 times as rich as cod-liver oil in vitamin D," of which she got 1½ drachms a day. Despite this she had all the physical and radiological signs of rickets, and also evidence of tetany (facial irritability and laryngismus stridulus); the serum calcium was 4·3 mg. per 100 c.cm. (ionic calcium 1·9) and the inorganic phosphorus 3·2. There was no evidence of renal disease or cœliac disease, and slow improvement took place under treatment with vitamin D and calcium intravenously. This is a case apparently at the opposite pole from that recorded by Dr. Thatcher on p. 20 of our present issue in which death from hypervitaminosis followed the use of cod-liver oil in doses by no means extremely large. Dr. Moncrieff's second case, moreover, is at least as remarkable, for here the patient developed typical scurvy at ten months, although he had had a good mixed diet and orange juice since birth amounting to half an orange daily for many months. In view of the apparent non-absorption of vitamin C he was given 400 mg. of ascorbic acid intravenously, after which he made a rapid recovery, and it might be interesting to know how he later responds to test doses of the vitamin. These cases are presumably to be regarded as examples of "conditioned" deficiencies, akin to the "starvation in the midst of plenty" of the sufferers from cœliac disease.

DENTAL CARIES AND DIET

A SMALL inquiry into the relation between sound teeth and diet is reported by Dr. Arthur Collett [2] of Oslo. Of two groups of children under school age, Group A belonged to a closed institution, while Group B consisted of children attending a nursery school but living at home. The latter group stayed at the school from 8.30 A.M. to 4 P.M. daily; their teeth were brushed there and they received a third of a litre of milk and a hot meal; but at home they were allowed plenty of sweets and soft bread, as well as fruit, vegetables, meat, and fish, and the state of their teeth was deplorable. Among 40 children between the ages of three and seven years, there were 584 holes in the teeth—i.e., 14·6 holes per child. (Every ruined or extracted tooth counted as two holes; the 42 teeth thus classified accounted accordingly for 84 of the 584 holes.) Very different was the dental lot of the 11 children of similar age in Group A. They had 209 milk teeth and 14 permanent teeth, and only 19 holes, 16 of which were already stopped, could be found. These 19 holes were distributed among 11 teeth, and no less than 9 of the 19 belonged to one and the same child who had been admitted to the institution at the comparatively late age of 2–3 years. All the 19 holes were in the milk teeth. The contrast is evident from the fact that while the A children had only 1·7 holes per child and 0·08 holes per tooth, only 4·9 per cent. of the teeth being holed, the B children had 14·6 holes per child. The numerical difference between the two groups was the more striking when correlated with the difference in the size of the holes in the two groups, those in Group A being minute, those in Group B painfully evident. Dr. Collett traces this difference in large part to the dietary of Group A which contained hardly any sweets and included over half a litre of milk (for the older children), home-baked bread containing 50 per cent. whole meal, margarine (no butter), a dessertspoonful of cod-liver oil every day throughout the year, and plenty of vegetables and some fruit. Every meal ended with uncooked fruit or carrots. The toothbrush and local dental hygiene were dispensed with, apart from the stopping of holes.

ANÆSTHETICS AND SHOCK

THE interrelationship of shock and anæsthesia, a matter of much practical importance, is by no means easy to determine. There is common agreement that insufficient narcosis may, on the advent of a painful nerve stimulus, lead to serious or even fatal shock. These cases are comparable with those in pre-anæsthetic days when a patient fainted or suffered fatal syncope at the first stroke of the knife. They are also comparable with that "psychic shock" which anæsthetists have learned to fear, when the disastrous stimulus is a mental or emotional one. In all these instances it is the absence of anæsthesia or much too light a dose which has made that shock possible. Sir Frederic Hewitt used to say that if consciousness is thoroughly abolished, at any rate when ether is the anæsthetic used, reflex fatal shock of this kind never occurs. At the other extreme, excessive anæsthesia through overdosage can produce a condition analogous to and hard to distinguish from surgical shock. The same effect occasionally follows an endothecal injection. There is, then, close association between insufficient anæsthesia and shock, and between excessive anæsthesia and shock. What may be termed normal anæsthesia is, however, regarded as one of the chief means of preventing shock during surgical operations. The efficiency for this purpose of various anæsthetics and certain methods of anæsthesia have been so clearly demonstrated by Crile that they are now generally accepted. At a recent discussion on surgical shock, given in our columns, one speaker is reported to have said [1] that "fluctuating depths of anæsthesia invariably cause shock." If the fluctuations are so extensive as to reach the two extremes, no doubt the statement is incontrovertible. But if as appears likely from the context, the speaker had in mind variations in anæsthesia within "normal" limits of depth, for example with the corneal reflex at one time abolished and at another allowed to return, we cannot agree with him. Variations of

[1] Jour. of Physiol., 1935, lxxxv., 26 P.
[2] Tidssk. f. d. Norske Laegefor., Nov. 15th, 1935, p. 1246.

[1] See THE LANCET, 1935, ii., 1413.

this kind are constantly allowed in practice by good anæsthetists. During long abdominal operations narcosis is intentionally lightened throughout the period when some anastomosis or other surgical procedure is carried out on insensitive viscera. When the peritoneum has to be dealt with and the abdomen closed the anæsthesia is deepened. In this way the patient receives far less of the drug than he would if he has been kept deeply under throughout the operation, irrespective of its stage or of the sensitivity of the tissues being cut or sewn. Far from facilitating shock, variation of depth in this manner is prone to lessen the risk of shock by reducing the chance of excessive anæsthetic.

THE NEW POISONS LIST

ON New Year's Day the Home Office issued the new list of scheduled poisons, leaving four clear months for its study before the new rules come into force on May 1st. The list is divided into two parts. In Part I. are those substances the sale of which is to be restricted to authorised sellers of poisons, i.e., registered pharmacists. In Part II. are those substances which may be sold only by registered pharmacists and persons registered for the purpose under the Pharmacy and Poisons Act, 1933; this part includes various poisons commonly used for agricultural, horticultural, sanitary, and domestic purposes. The new rules impose certain additional restrictions, including, notably, regulation of the transport of poisons, prohibition of the sale to the public of certain potent medicinal poisons except upon a prescription given by a qualified medical, dental, or veterinary practitioner, and prohibition of the sale of strychnine except for medicinal purposes. Copies of the Poisons List, the Poisons Rules, and the form prescribed for application to be made to the local authority for registration for the sale of the substances in Part II. of the Poisons List may now be had from H.M. Stationery Office.

EFFECTS OF HORMONES ON THE PITUITARY

So much is written about the way in which the anterior pituitary acts on other endocrine organs that one is apt to forget that these other organs also influence the anterior pituitary. The latter is not really a "master gland," since it is in some respects subordinate to the activities of its "subjects"; it is only one of several factors in a dynamic equilibrium. Thus for some years it has been known that histological changes are produced in the anterior pituitary by castration of either male or female, and in castrated animals concurrent increases in the content and output of gonadotropic hormones have been observed. Administration of œstrin to the castrated female has been found to inhibit the histological changes, or to restore the histological picture to normal; but so far the restoration of the anterior pituitary has not been achieved with androsterone, the excretory form of the male hormone,[1] although it has been reported by Migliavacca [2] for a hormone preparation from urine, and by McCullagh[3] for a water-soluble fraction from testes. It remains to be seen whether the recently isolated testosterone will have this effect. As regards less radical changes in the anterior pituitary, which take place without gross histological signs, evidence is rapidly accumulating which bears on the reciprocal action of the anterior pituitary and the gonads and on the mechanism of the menstrual cycle. Many authors have described inhibitory effects of œstrin administration upon ovarian growth and development in the normal animal, but the results in this field are often confusing and contradictory, evidently because of wide variation in factors now recognised to be important, such as amounts and form of hormone administered, period of treatment, and the condition of the animal. As an example of recent work, in which detailed analysis of the effects has been made, we may quote Lane,[4] who injected œstrin into infantile female rats for varying periods and then examined the pituitaries by removing them and implanting them into a second series of rats. The follicle-stimulating hormone was at first increased in amount above normal, and then inhibited, ultimately completely. Secretion of the luteinising hormone, on the other hand, seemed to be increased throughout the experiment. A stimulating effect of œstrin on the anterior pituitary has been recorded by other authors, for instance by Deanesly,[5] who observed ovulation in pseudopregnant mice after administration of œstrin, probably as a result of appropriate enhancement of the secretion of follicle-stimulating and luteinising factors.

Dahlberg [6] has applied the idea of a balance between œstrin and anterior pituitary hormones to explain the inhibition of ovulation in the human being after the liberation of one ovum and the continued repression of ovulation during pregnancy, though he favours the assumption of a direct antagonism in the ovary rather than the mechanism of pituitary inhibition. The experiment in support of this theory consisted in the inhibition, by injection of follicular fluid, of the ovulation normally induced in the mouse by injection of urine of pregnancy (containing prolans). Zondek failed to confirm this phenomenon with injections of œstrin, but other evidence indicated that an inhibition of this type might exist, and Dahlberg claims that the discrepancy is due to differences in the mode of administration. It is known that continual small doses are more effective than a single large dose, owing probably to the rapid destruction and excretion of the water-soluble hormone; oral administration, although the fraction absorbed is less, ensures more continuous absorption, and under these circumstances the original experiments have been confirmed. It seems, therefore, that in the pregnant woman there is enough œstrin continuously in the circulation to prevent ovulation, but not enough to injure the ovaries. When such blood is injected into a mouse in the usual pregnancy test the single dose of œstrin, quickly absorbed and quickly excreted, is not sufficient to interfere with the ovulation produced by the prolans.

Now the anterior pituitary, in spite of the multiplicity of the endocrine-stimulating functions attributed to it, has only three distinguishable types of cell—chromophobes, basophils, and acidophils—the accepted view being that the first type is a reserve or foundation cell which may develop into either of the other two. It is therefore reasonable to suppose that doses of œstrin which affect the gonadotropic activity of the anterior pituitary will have a parallel effect on the other activities if these are exercised by the same cells. Actually suppression of the

[1] Crooke, A. C., and Korenchevsky, V.: Proc. Roy. Soc. Med., 1935, xxviii., 1266.
[2] Migliavacca, A.: Boll. Soc. Ital. Biol. Sperim., 1935, x., 105.
[3] McCullagh, D. R.: Science, 1932, lxxvi., 19.
[4] Lane, C. E.: Amer. Jour. Physiol., 1935, cx., 681.
[5] Deanesly, R.: Jour. of Physiol., 1931, lxxii., 62.
[6] Dahlberg, G.: Jour. Obst. and Gyn. Brit. Emp., 1935, xlii., 953.

diabetogenic activity by œstrin has been demonstrated,[7] but Shumacker and Lamont [8] failed to find any effect of œstrin (in doses of 9 "rat units" per day) on the somatogenic, thyrotropic, adrenotropic, or even gonadotropic activities, as indicated by the changes in weight of the body and separate organs after a period of 67 days. Engel [9] found that the effect of growth hormone on rats was not modified by the simultaneous administration of male hormone or œstrin. On the other hand, Bernhard Zondek, in a paper published in our present issue, has demonstrated that administration of massive doses of œstrin to young rats over a long period not only represses development of ovaries or testes, but has a most striking effect in inhibiting growth, reducing body-weight by as much as 43 per cent. as compared with control animals. In addition, he forecasts the publication of data showing effects on the thyrotropic and other activities of the pituitary, as well as changes in the anterior pituitary itself. Correlating these observations with the recorded result of thyroid feeding on the anterior pituitary and secondarily on the œstrous cycle of rats [10] it seems that we are on the threshold of a closer understanding of the interrelationship of the anterior pituitary and the other endocrine organs, and of the manifold effects of administering a single hormone. Such understanding should lead to a yet more rational system of hormone therapy.

CARRIER LICENCES

THERE would not at first sight appear to be much of particular interest to medical men in a treatise [11] on "The Law Relating to Carriers' Licenses, under the Road and Traffic Act, 1933," unless indeed they wished for some strenuous intellectual exercise. The numerous full and complicated enactments from the Railway and Canal Traffic Act of 1854 to that of 1933 offer an intricate study for anyone rash enough to attempt their understanding without a training in the law. Mr. Maxwell has set out to make their principles and precepts clear to all those concerned with transport on the roads. And it is here that the doctor will find his curiosity justified if he looks into this volume; indeed, he may see a certain cause for alarm. Mr. Maxwell shows him that he is, according to the wording of the law, subject to penalties in which he could not expect to be involved by the ordinary use of his car. Here is one passage from the chapter on offences: "the conclusion can hardly be avoided that every motor car fitted with any kind of convenience for carrying the luggage or effects of passengers or any other kind of load is a goods vehicle, and that a license is required to carry anything in any motor car in connection with a business. . . ." This definition seems certain to include the car in which the doctor carries his case of drugs, his emergency outfit, his anæsthetic bag, and so on. Later on comes the more specific statement: "if an engineer needs a license to carry his tools a surgeon should need a license to carry his instruments," and the author goes on to show that the typist might need one to carry his typewriter, and perhaps the barrister to carry his briefs. It appears that much of the drafting of the bills governing traffic is faulty, making the clear meaning of the law difficult to discern and indeed, if taken strictly, not seldom reducing the law to absurdity. Mr. Maxwell, an authority on railway law, has been impressed with the necessity of clearing up the muddle if people are to have a fair chance of evading liabilities for which they are unlikely to realise their responsibility, and his book should be of service to the many persons who become involved in litigation through incidents of road travel of one kind or another.

[7] Barnes, B. O., Regan, J. F., and Nelson, W. O.: Jour. Amer. Med. Assoc., 1933, ci., 926; Nelson, W. O., and Overholzer, M. D.: Proc. Soc. Exp. Biol. Med., 1934, xxxii., 150.
[8] Shumacker, H. B., Jun., and Lamont, A.: Proc. Soc. Exp. Biol. Med., 1935, xxxii., 1568.
[9] Engel, P.: Klin. Woch., 1934, xiii., 1540.
[10] Campbell, M., Wolfe, J. M., and Phelps, D.: Proc. Soc. Exp. Biol. Med., 1934, xxxii., 1205.
[11] The Law Relating to Carriers' Licenses under the Road and Rail Traffic Act, 1933. By Eric F. M. Maxwell, of the Inner Temple and Northern Circuit, Barrister-at-Law. London: Sweet and Maxwell Ltd. 1936. Pp. 330. 15s.

HEPATIC LESIONS IN CONGENITAL SYPHILIS

THE morbid anatomist nowadays sees relatively little of the lesions of acquired syphilis, at any rate in a frank and easily recognisable form; the gumma has become a rarity and even syphilitic aortitis is nothing like as common as it was. Still more uncommon are the lesions of the congenital form of the disease, for antenatal and infant welfare and venereal disease clinics are making their influence felt, not to speak of the increased vigilance in this direction of the general practitioner. Nevertheless, from time to time an unhappy infant slips through the therapeutic net and may in due course present very puzzling problems to the unwary pathologist. In a scholarly article in the recently established *Indian Journal of Venereal Diseases* (1935, i., 183) Dr. P. Ramachandra Rao discusses in detail the manifestations of congenital syphilis as seen in the liver. This organ, as he points out, is particularly liable to be affected by the disease, for the maternal blood passes directly to it through the umbilical vein and only reaches the rest of the body after it has passed through its capillaries. The intense saturation of the liver with spirochætes, with the accompanying fine fibrosis and the development of miliary gummata, is the form of congenital syphilitic disease of the liver which is familiar to everybody. Less well recognised are the later or more chronic manifestations, for, as Dr. Rao observes, it may be impossible to demonstrate spirochætes in them. Often enough the syphilitic nature of the lesions can only be presumed from the clinical history or the recognition of more characteristic changes elsewhere in the body. Among these more obscure hepatic lesions Dr. Rao includes chronic periportal pylephlebitis, pericholangitis, and endophlebitis of the hepatic vein, illustrating his thesis by descriptions of interesting cases occurring in the autopsy practice of the King George Hospital of Vizagapatam. A number of helpful photomicrographs are included and the value of the article is enhanced by a very complete bibliography.

USE OF MENTHOL IN CHILDHOOD

IN an annotation on the treatment of the common cold in France, published a fortnight ago, we mentioned the apparent unpopularity of menthol as a remedy. In adults toxic symptoms due to the use of this drug must be extremely rare, but as long ago as 1912, it seems, R. Leroux wrote in no uncertain terms of the danger of its use in childhood, and particularly in infancy, even when given by intranasal instillation in vaseline. He thought that it was liable to produce reflex inhibition of both respiration and cardiac action, and that its action and dangers were exactly comparable to those of chloroform anæsthesia in its early stages. It happens that Dr. Champeau has just recorded [1] severe disturbances

[1] Bull. de l'Acad. de Méd., 1935, cxiv., 448.

in a child 4½ years old which he attributes to the ingestion of 6 mg. of menthol. Having previously suffered from adenoids, she was given three sweets, each containing 2 mg., at the onset of an upper respiratory infection. The menthol was in high concentration (1 in 100), since each sweet was only approximately 20 cg. in weight. An hour after the drug had been administered, the child suddenly appeared tired and asked to be put to bed; she then became very pale, with coldness of the extremities and cyanosis of the face. Respiration was spasmodic, and the pulse rapid and irregular, ceasing entirely for periods of several seconds during which the diaphragm was in spasmodic contraction; she also vomited. The crisis lasted in all about three-quarters of an hour, the condition improving after injection of camphorated oil. At Champeau's suggestion, the Medical Society of Évreux, at its general meeting last October, unanimously recommended that all menthol products should be clearly labelled as containing a drug for adult use and dangerous to children, and that the medical and pharmaceutical faculties should have their attention drawn to the danger of prescribing menthol in early life. We may note that Martindale and Westcott's "Extra Pharmacopœia" already contains a similar warning: "It is dangerous to apply an ointment containing menthol to the nostrils of infants, e.g., for treatment of catarrh,—may cause instant collapse." The same caution is applied to camphor.

THE HEALTH OF THE AIR FORCE

DURING the year 1934 the Royal Air Force maintained its good health and the incidence of disabilities fell, in fact, by more than 5 per cent. There was a total of 19,344 cases of sickness, an incidence of 632 per 1000 of strength which, compared with the periods 1928–33 and 1921–27, showed a decrease of 48 and 362 per 1000. This incidence equals that of 1932, which was the lowest since the reports began in 1920. The number of deaths of those invalided from the service and of venereal infections was each the lowest on record. The chief causes of disability were injury and venereal disease, respectively 77 and 9·9 per 1000. Of the 94 deaths, injury accounted for 58, and 24 of these were due to flying accidents. As in previous years, pulmonary tuberculosis and psychoneurosis were the commonest causes for invaliding 155 men out of the service. Disease and injury as causes of sickness bear the usual relation to one another, the former constituting 80·5 per cent. of the total. A notable decrease occurred in the number of cases due to influenza, respiratory disease and diseases of the skin. Though an epidemic of dysentery in Iraq produced a sharp rise to 156 cases, the incidence of malaria and sandfly fever fell to 373 and 283 respectively. After injury, the commonest cause of sickness was disease caused by infection, with diseases of the digestive system second on the list. The average duration of each case was 17 days. Expansion of the service has led to an increase in the routine work of the central medical establishment, and a study has been made of the effects of strain resulting from the rapid development of aircraft. During the year the results were published of research in the significance and treatment of heterophoria and in the relationship between body-build and functional efficiency,[1] when it was shown that overweight men were more capable of enduring both physical and mental strain than those under weight. In the pathological laboratories at Halton there has been research into the ætiology of tonsillitis and droplet infections among the aircraft apprentices. A report of the possibility of yellow fever at places in the Sudan used for landing grounds by both the Air Force and the civil airways led to an investigation throughout the country. Serological tests proved that though yellow fever probably had been present in the past there was little risk of foreigners contracting the disease, and therefore there was no interference with the air services beyond quarantine examination and disinfection.

[1] THE LANCET, 1934, i., 1377 and 1399.

THE POPULATION PROBLEM IN INDIA

FROM a study of the growth of populations[1] Colonel C. A. Gill, I.M.S., has advanced the view that various population types can be differentiated, each representing a different stage of growth from "infancy" to "old age." The passage through these stages is dependent, he believes, on natural laws of populations which secure the progressive evolution of the human race. In general it appears from his argument that the stage of growth reached must govern the legislative and administrative action required for the needs of specific populations. In particular in British India, which Gill classified as in the "nascent" stage, any appreciable and continuous reduction of the birth-rate must, he asserts, place a check upon progressive evolution unless it is associated with a corresponding reduction of the death-rate. He therefore argues that any endeavour to popularise the use of contraceptives in that country would be a biological blunder.

From these views, outlined in our columns early this year,[2] Lieut.-Colonel A. J. H. Russell, Public Health Commissioner with the Government of India, and Prof. K. C. K. E. Raja, of the department of vital statistics and epidemiology of the All-India Institute of Hygiene and Public Health, dissent completely.[3] Neither in vital statistical indices nor in the evidence relating to fecundity marshalled by such workers as Carr-Saunders do they find any support for Gill's theory of a decreasing urge of prolificity as a biological phenomenon when we pass from primitive to mature population types. It seems that the regulation of numbers has exercised the mind of man at all times and various means of achieving this regulation were present in primitive pastoral communities as well as in countries of modern civilisation. It is certainly difficult to see why we should be running counter to the purposes of nature by adopting contraception in preference to abortion and infanticide. If India, in particular, is to reach and maintain a higher standard of living the question of family limitation must, Russell and Raja urge, become one of increasing importance. The present picture they draw of her population is that of a community living at an extremely low standard and growing at a pace which is outstripping or threatening to outstrip its food-supply. Even if some allowance is made for a speedier development of her natural resources the attainment of higher standards of health and comfort, demand, they say, some retardation of the present rate of growth.

This conclusion can hardly be regarded as an overstatement. The position is frankly regarded as disturbing by such observers as Sir John Megaw whose opinion is quoted in this paper. "There is every reason to believe," he has said, "that the maximum increase which can be hoped for in the production

[1] Jour. of Hyg., 1934, xxxiv., 502.
[2] THE LANCET, 1935, i., 563.
[3] Ind. Jour. Med. Res., 1935, xxiii., 545.

of the necessaries of life will not keep pace with the growth of the population so that there is a prospect of a steady deterioration in the state of nutrition of the people." Does evolution really demand this high natality and the high mortality to which it must apparently lead? On another page of our present issue is set out Sir John Megaw's own answer to this question. In India, he says, a comprehensive food policy is needed to save that country from a relapse into barbarism. Educated Indian opinion already recognises this and he is hopeful of the success of a concerted national movement.

NEW YEAR HONOURS

THE decorations and dignities conferred by the King this New Year are few compared with those granted in last year's list of Birthday honours, which commemorated the Silver Jubilee. Of the five new knighthoods, Dr. Knuthsen's is a promotion in the Royal Victorian Order, two are given for services in India, and two go to surgeons of high distinction, Prof. Wilkie of Edinburgh, and Mr. Devine of Melbourne. Outside the straiter bounds of medicine we are glad to note that the list of new knights includes the name of Prof. Arthur Harden, F.R.S., biochemist and Nobel prizeman, while others closely associated with medical activities are Mr. Percival Hartley, D.Sc., director of the Department of Biological Standards, Mr. J. F. Marshall, director of the British Mosquito Control Institute at Hayling Island, and Miss Olga Nethersole, founder of the People's League of Health, all of whom are created C.B.E. Sir Gomer Berry, who receives a peerage, has been for many years an open-handed supporter of hospitals and the medical efforts associated with them. To these and to all whose names are set out on p. 60 we offer congratulations.

THE LITERATURE OF BLOOD TRANSFUSION

FIFTEEN years ago a bibliography of blood transfusion would have consisted of one to two hundred entries dealing chiefly with the early experiments on the technique. Since 1920 the subject has grown enormously and its ramifications are still spreading as the difficult subject of blood groups and reactions is slowly unravelled, and as the indications for transfusion increase. A bibliography of the whole field has now been compiled by Dr. E. Koenig[1] in Russia, and although this only covers the period 1900–33 the number of entries runs to 4323. It is improbable that even so it is complete, but it is comprehensive enough to be extremely valuable to everyone working on any aspect of the problem. The bibliography has been compiled by the Scientific Research Institute for Blood Transfusion in Leningrad and is published conjointly by the Institute and the *Vestnik Chirurguii*. The titles of the Russian, German, English, French, and Italian papers are printed in the original languages, and there are in addition German translations of the titles from Czech, Danish, Dutch, Estonian, Georgian, Hungarian, Japanese, Norwegian, Polish, Portuguese, Rumanian, Serbian, Spanish, Swedish, Ukrainian, and White-Russian sources. The whole subject has been divided into 22 sections and 77 subsections, the headings of the sections being printed in the first five languages mentioned. The book is therefore a model of what an international bibliography should be, and it is difficult to see how its plan could be improved. Its general accuracy can only be properly assessed by use, but it seems possible that the index of names could be made fuller; for example, one name which appears six times in the bibliography is only given two entries in the index. The compilation of the list is still proceeding, and a supplement will be published when sufficient material has accumulated. Suggestions will be welcomed by the Institute for Blood Transfusion in Leningrad.

[1] International Bibliography on the Problems of Blood Transfusion and the Theory of Blood Groups, 1900–1933. By Dr. E. Koenig. Leningrad: Vestnik Chirurguii. 1935. Pp. 226. R.12 k.50.

THE second International Congress of Microbiology will be held in London from July 25th to August 1st under the presidency of Prof. J. C. G. Ledingham, F.R.S. The congress will have its headquarters at University College, and its meetings have been arranged under the following sections: general biology of micro-organisms (president, Prof. E. Gotschlich, Heidelberg); viruses and virus diseases in animals and plants (Prof. R. Doerr, Basle); bacteria and fungi in relation to disease in man, animals, and plants (Mr. E. J. Butler, F.R.S., London, and Prof. H. Zinsser, Boston); economic bacteriology, soil, dairying, and industrial microbiology (Prof. R. E. Buchanan, Iowa); medical, veterinary, and agricultural zoology and parasitology (Prof. E. Brumpt, Paris); serology and immunochemistry (Prof. K. Landsteiner, New York); microbiological chemistry and specific immunisation in the control of human and animal disease (Prof. W. H. Park, New York). The hon. general secretary for the congress is Dr. R. St. John Brooks, Lister Institute of Preventive Medicine, Chelsea Bridge-road, London, S.W. 1.

INFECTIOUS DISEASE

IN ENGLAND AND WALES DURING THE WEEK ENDED DEC. 21ST, 1935

Notifications.—The following cases of infectious disease were notified during the week: Small-pox, 0; scarlet fever, 2522; diphtheria, 1216; enteric fever, 14; acute pneumonia (primary or influenzal), 1073; puerperal fever, 30; puerperal pyrexia, 107; cerebro-spinal fever, 17; acute poliomyelitis, 6; acute polio-encephalitis, 1; encephalitis lethargica, 10; dysentery, 48; ophthalmia neonatorum, 72. No case of cholera, plague, or typhus fever was notified during the week.

The number of cases in the Infectious Hospitals of the London County Council on Dec. 27th was 3590, which included: Scarlet fever, 1171; diphtheria, 1204; measles, 250; whooping-cough, 399; puerperal fever, 20 mothers (plus 15 babies); encephalitis lethargica, 280; poliomyelitis, 3. At St. Margaret's Hospital there were 14 babies (plus 2 mothers) with ophthalmia neonatorum.

Deaths.—In 121 great towns, including London, there was no death from small-pox. 4 (1) from enteric fever, 39 (4) from measles, 8 (0) from scarlet fever, 20 (6) from whooping-cough, 55 (9) from diphtheria, 39 (9) from diarrhœa and enteritis under two years, and 67 (8) from influenza. The figures in parentheses are those for London itself.

Portsmouth, Manchester, and Grimsby each had 1 death from enteric fever. Liverpool reported 12 deaths from measles, Manchester 6, Bootle 3, Blackburn, St. Helens, and Stockton-on-Tees each 2. Liverpool also reported 5 deaths from whooping-cough. The deaths from diphtheria were reported from 30 great towns; 5 from Birmingham, 4 from Huddersfield, 3 each from Bradford and Sunderland. The mortality from influenza is scattered over 34 great towns, Manchester and Birmingham each reporting 6, Liverpool 5, Southampton 3, no other great town more than 2.

The number of stillbirths notified during the week was 254 (corresponding to a rate of 42 per 1000 total births), including 49 in London.

PROGNOSIS

A Series of Signed Articles contributed by invitation

LXXXIII
PROGNOSIS IN TRIGEMINAL TIC

CHRONIC paroxysmal neuralgia of the trigeminal nerve, or trigeminal tic, may be said never to be cured by drugs, or to disappear spontaneously. It may start gradually, with shoots like toothache, or it may leap suddenly into consciousness with a shattering explosion of pain in the face. Once started, the pain is bound to recur again and again, though there may be in some cases intervals of years of complete freedom in the earlier stages. Gradually the attacks become more frequent, and usually more severe as the years pass, till ultimately scarcely a day passes without numerous stabs of almost intolerable agony in jaw, tongue, nose, and sometimes eye and forehead.

I have seen two women who had suffered for over fifty years, one having commenced the paroxysms at the early age of twelve. Often, but not always, as time goes on the neuralgia may spread from the original site in one or other jaw, or possibly the eyebrow, until it involves all three divisions of the trigeminal area on one side. Sometimes the pain remains located in upper or lower jaw alone, but invariably if the pain starts in the first division, in eyebrow and forehead to top of head, the neuralgia ultimately spreads downwards to involve the nose and upper lip and cheek, spreading from the first into the second division, though several years may elapse before this takes place.

Inheritance of the disease is not very rare, the neuralgia almost invariably appearing at a younger age in the second generation, and again younger in the third. I have had two patients of a family in which nine members suffered, three in each of three generations, the disease appearing at the age of 16 in two sisters, and at 20 in their brother, in the third generation.

TREATMENT BY ALCOHOL INJECTION

The easiest form to treat successfully is third division tic, the pain affecting the lower jaw only and perhaps the same side of the tongue. A properly placed alcohol injection into the nerve at its exit from the foramen ovale will instantly numb the lower jaw, chin, and lip, and half the tongue, so that the tongue movements become free and easy, and no longer cause painful spasms, and eating and swallowing are immediately possible without causing any of the distress previously felt. Owing to the numbness of the left gum and inside of cheek and the half of the tongue, it is preferable for the patient to eat on the other side of the mouth; the weakness of the biting and chewing muscles on the affected side, produced by the involvement of the motor root in the alcohol injection, tends to upset what dentists call the "bite" and the alignment of the dentures. The motor fibres usually recover with 3 months, though the anæsthesia and freedom from pain may be measured by years. I have seen numerous cases of five years' standing and upwards with complete freedom after injection of the third division only, and I have seen recurrence after 13 years and 15 years, while another patient is still quite free after 26½ years.

The reason for the long periods of relief after third division injection, as compared with the results after second division injection, is that when the alcohol is injected into the nerve at the foramen ovale, a certain amount often enters the Gasserian ganglion and destroys a number of nerve-cells in its outer part, so that partial numbness and light anæsthesia is apt to be permanent, sufficient in certain individuals to keep the neuralgia at bay almost indefinitely. When the second division is injected, at or in front of the foramen rotundum, no alcohol will reach the Gasserian ganglion, and though complete and total anæsthesia of the cheek, jaw, and palate on that side may result, with immediate relief of the neuralgia, yet new nerve-fibres grow down from the ganglion cells fairly rapidly, and in twelve months or less sensation may be practically normal again, and thus no obstacle remains to the passage upwards of the painful impulses from the periphery.

ROOT RESECTION OR GANGLION INJECTION

Since recurrence of the neuralgia in second division cases is usual after a year or two, the question of either root resection or ganglion injection must be considered. If the second division alone is involved, then injection at the foramen rotundum should always be done as the preliminary treatment, for two reasons: first, because it is possible in a few cases to obtain relief lasting many years; and secondly, to accustom the patient to the permanent numbness that would result from the ganglion injection or root resection. A small proportion of patients object intensely to the numbness, and the preliminary injection will be a test as to whether they would prefer to endure the neuralgia, if it returns, or to put up with permanent numbness as the price of a cure. If the first division is involved together with the second, the pain shooting up the forehead to the vertex, and perhaps in the eyeball itself, then it will probably be useless to inject the second division only, and it will be necessary to deal with the ganglion at once, or else have the sensory root resected. It is possible in these cases to inject the inner two-thirds of the ganglion only, leaving normal sensation on the unaffected lower jaw and tongue, which is a considerable comfort to the patient. Though the motor root may be paralysed at first, it nearly always recovers within about three months. By the open method of operation for root resection, it is now possible to save the motor root in most cases, and from the method of fractional root resection, leaving uncut a small bundle of fibres on the inner side of the root, incomplete anæsthesia results, especially of the ophthalmic branch, so that the risk of keratitis is much diminished.

CARE OF THE CORNEA: KERATITIS

The care of the cornea is very important for the first few weeks after total root resection or ganglion injection. If, however, the eye is shaded from the first by a close-fitting curved straw-plait shade, no lint or wool being used under the shade, and the conjunctival sac washed out twice daily with weak (1 in 7) boracic lotion, then in almost all cases the eye remains healthy, and the shade can be gradually discarded after five or six weeks. If, through carelessness, or for other reasons, such as the presence of facial palsy, the cornea is insufficiently protected, or should there be a pre-existing conjunctivitis or trachoma, then keratitis is much more likely to supervene, and it will be necessary to close the lids by tarsorrhaphy, and not reopen them for several months. Hence, before deciding on a total root

resection or ganglion injection, it is important to examine the vision of the two eyes; if the eye on the side of the neuralgia is the only sound eye, the patient's difficulties are much increased by having the eye closed, even for a few weeks, and should serious keratitis develop, the loss of vision will be tragic. Fortunately, with proper care of the eye from the moment of completion of the injection, or operation, keratitis should never develop, unless facial palsy or conjunctivitis are present. Facial palsy is not a rare complication of root resection; it is associated with traction or other interference with the Vidian nerve as it runs beneath the ganglion.

OTHER COMPLICATIONS

With a ganglion injection, slowly and properly performed, facial palsy is very rarely seen, though occasionally vertigo, and nystagmus to the opposite side, owing to leakage of alcohol backwards to the internal auditory meatus, may give trouble for periods from a few minutes to an hour or two. Herpes on the upper lip and side of nose is common, both after injection of the ganglion and root resection, but it gives no real trouble and leaves no scars or post-herpetic pain. It is not a true zoster, and its serum reactions are those of herpes febrilis. Temporary diplopia is also met with occasionally, both after injection and root resection.

With total anæsthesia of the third division, there is a liability for the patient to bite the lower lip, inside of cheek, or even the tongue, during the first three days. This tendency is attributable to the strange feeling of the numb parts; but re-education is speedy, and no trouble of this kind occurs after the first few days, during which soft food only is advisable.

In a small proportion of cases, cure of the paroxysmal neuralgia, whether by injection or root resection, may be followed by persistent burning sensations in cheek and eye; shooting pains may even be complained of, or a sensation of discomfort or coldness in the eye. Mostly these sensations appear to be of a psycho-neurotic nature. They do not appear at once, but a month or two after an operation which appears at first to have been the usual success. Possibly sympathetic nervous disturbance is a factor in some cases, and I have had one case in a young woman in whom stellate ganlionectomy relieved the symptoms.

BILATERAL TIC

In 4 to 5 per cent. of the cases similar neuralgic pains attack the other side; occasionally from the commencement both sides may suffer, though the pain on one side is usually much more severe at first; ultimately it is probably equally severe on the two sides, sometimes alternating. Women suffer from trigeminal tic much more frequently than men, perhaps twice as often, and when the disease is bilateral, the proportion of women to men is, as might be expected, doubled, about four to one.

Bilateral injection of the foramen ovale, if the two injections are performed within three months of each other, will cause jaw drop, and soft food will be necessary. Even though the anæsthesia remains total and permanent, the motor roots usually recover in a few months, as their trophic-cell nuclei are in the pons. If root resection is done, the motor root can usually be saved, but, if it is cut, it never regenerates. Bilateral facial anæsthesia does not worry the patients much, though the processes of eating may require practice with a mirror.

WILFRED HARRIS, M.D., F.R.C.P.

Senior Physician, Hospital for Epilepsy and Paralysis, Maida Vale; Consulting Physician, St. Mary's Hospital, London.

THE SERVICES

ROYAL NAVAL MEDICAL SERVICE

Surg. Lt.-Comdr. T. L. Cleave to *President* for course.

Surg. Lts. J. M. Fitzpatrick to *Enterprise*; N. C. Hepburn, W. F. Viret, and F. H. Lamb to *Pembroke* for R.N.B.; H. G. Silvester and D. Simpson to *Victory* for R.N.B.; A. E. Ginn, D. Shute, and J. Lees to *Drake* for R.N.B.; and J. Carlton to *Hood*.

ROYAL NAVAL VOLUNTEER RESERVE

Surg. Lt. P. C. Lewis to R.M. Barracks, Plymouth.

W. S. Walton entered as Proby. Surg. Lt.

ARMY MEDICAL SERVICES

Col. J. P. Helliwell, C.B.E., late A.D. Corps, to be Maj.-Gen.

Lt.-Col. J. V. M. Byrne, from A. D. Corps, to be Col.

Maj.-Gen. J. P. Helliwell, C.B.E., from Asst. Dir.-Gen. Army Med. Servs. (for the Dental Serv.), to be Dir. Army. Dental Serv.

ROYAL ARMY MEDICAL CORPS

ARMY DENTAL CORPS

The undermentioned Majs. to be Lt.-Cols.:—

A. B. Austin, F. H. W. Beer, J. P. Duguid, A. Gibson, and R. J. Condie.

The undermentioned Capts. to be Majs.:—

W. Wormington, J. B. Cowie, M.M., F. H. R. Davey, F. F. Anslow, W. J. R. E. Edwards, F. S. S. Whiter, D. C. Blyth, F. G. Arnold, R. H. N. Osmond, W. G. Bradbeer, and B. J. Swyer.

The undermentioned Lts. to be Capts.:—

H. C. Dobbie, G. M. Sinclair, H. W. South, C. E. Howell, K. H. Coulton, J. E. C. Robinson, and R. H. Green.

ROYAL AIR FORCE

The undermentioned promotions are made with effect from Jan. 1st, 1936:—

Air Commodore to be Air Vice-Marshal: Alfred William Iredell, K.H.P.

Wing Commanders to be Group Captains: Gerald Struan Marshall, O.B.E., and Raymond William Ryan.

Squadron Leaders to be Wing Commanders: George Henry Hope Maxwell, William Edward Barnes, James Daly Leahy, M.C., Edward Cyril Knowles Henry Foreman, and William John Greaves Walker.

Flight Lieutenant Leonard Freeman is promoted to the rank of Squadron Leader.

Dental Branch.—Flying Officer William Vernon Anthony Denney, L.D.S., is promoted to the rank of Flight Lieutenant.

The undermentioned are granted short service commissions as Flying Officers for three years on the active list:—

C. F. R. Briggs, H. D. Conway, L. M. Crooks, W. J. Fowler, I. K. Mackenzie, H. C. de B. Milne, D. J. Sheehan, and R. F. Wynroe.

Dental Branch.—R. M. Brown and W. E. Nelson are granted non-permanent commissions as Flying Officers for three years on the active list.

INDIAN MEDICAL SERVICE

Lt.-Cols. P. S. Mills and D. C. V. Fitzgerald, M.C., to be Cols.

The King has approved the award of the Distinguished Service Order for gallant and distinguished service in action in connexion with the recent Mohmand operations, North West Frontier of India 1935, to Capt. F. J. Doherty, M.B., I.M.S., attached 5th Battalion (Queen Victoria's Own Corps of Guides), 12th Frontier Force Regiment, Indian Army.

SPECIAL ARTICLES

MEDICAL EDUCATION AND MEDICAL RESEARCH*

By W. W. C. Topley, M.D. Camb., F.R.C.P. Lond., F.R.S.

PROFESSOR OF BACTERIOLOGY AND IMMUNOLOGY IN THE UNIVERSITY OF LONDON AT THE LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE

We should all, I fancy, be hard put to it, if asked to explain what medical research means. For our present purpose we may take it as a convenient label covering a multitude of interrelated activities, all concerned, immediately or remotely, and sometimes very remotely with the study of disease in man. Proceeding from this *ad hoc* definition, we may consider how our present medical curriculum fits people to work in different parts of this very extensive field.

Before doing so I should like to make two things clear. Firstly I am, in the main, thinking in terms of the whole-time research worker—the man who intends to devote himself to research, or to research and teaching, as opposed to practice. Secondly, I am airing personal opinions with which I have no reason to suppose that anyone would agree.

Words are tricky things, and I may easily fail to convey the meaning I intend, or to put the emphasis in the right place; so that I propose to start at the end, and state my conclusions quite clearly before I give my reasons for them. The theses that I am attempting to maintain are these:

(1) That the present medical curriculum, in its usual form and including all such modifications of it as are in sight, however adequate it may be for the purposes for which it was designed, fails badly as a method of providing recruits for medical research, except, perhaps, in the strictly clinical field.

(2) That the reason why the medical curriculum fails, from the research point of view, is that, except in the strictly clinical field, the success of a research worker will depend more on his knowledge of the basic sciences on which medicine is founded than on his detailed knowledge of practical medicine or surgery in the clinical sense.

(3) That medical research, at least on its laboratory side, is not an activity that can profitably be adopted as an alternative to practice at some late stage of a student's career, but must be consciously prepared for, from his earlier university days onward.

The Background Needed for Research in Various Fields

In giving my reasons for these statements, it will be convenient to start by taking samples of different kinds of research workers, and considering the things they must know in order that they may work effectively.

CLINICAL RESEARCH

To preserve a proper sequence I am forced to start with a subject on which I can speak with no authority at all—medical research in what is, perhaps, its strictest sense, the acquirement of new knowledge in regard to disease by observations carried out at the bedside. The proper name for this is clearly clinical research. Speaking as an outsider, it has always seemed to me that clinical research, in the true sense of that term, demands a combination of qualities, and a breadth of knowledge, of a very exceptional kind. It may, I think, be laid down as an axiom that no one is likely to make any real advance in our knowledge of disease unless he has the scientific outlook—science and pseudo-science are poles apart. Pseudo-science is even harder to define than medical research; but since it is a very horrid and insidious intellectual infection, to which we medicos are freely and frequently exposed, it may be worth noting some of its signs and symptoms. One of the worst is the uncritical application to practical medicine of procedures derived from physiological or pathological principles under conditions where there is no evidence that those particular principles are applicable. I suppose that the exploitation of hormones, or of bacterial vaccines, can supply some of the most fearsome examples, just as, when used as they should be, these reagents afford some of the most striking instances of the scientific cure or prevention of disease. Another symptom of medical pseudo-science is a confusion of apparatus with method, a belief, for instance, that things done in a laboratory are necessarily more scientific than things done outside it. In the absence of a clear grasp by a clinical worker of the implications of laboratory tests, or of a close and personal liaison between workers in the laboratory and in the ward, this form of the disease can be very harmful. Perhaps the most insidious form in which pseudo-science can attack us is that of rationalisation—the tendency we all have to make up reasons as to why we do things, or why things happen, without submitting our reasoning to the tests of repeated observation and experiment that science dictates. If we give way to this, if we mistake a guess for a working hypothesis, and a working hypothesis for a well-established theory, then we are lost.

But the scientific outlook—the determination not to go beyond our evidence and to test each link in our chain of reasoning—is much easier to maintain when the things we are thinking about do not matter very much to ourselves or anybody else. The more they matter, in this emotional sense, the harder it is to regard them as data for consideration, or problems for investigation, rather than as practical problems that have to be tackled somehow or other, and as quickly as possible. Now clinical medicine does matter very much, and I should say that the purely scientific outlook is, for the ordinary person, entirely impossible. If it were possible it would, I think, defeat itself; because the subject of clinical research is not sickness, but the sick person, and a lack of emotional understanding will render the clinician blind to half his problem. So we must make many demands of our clinical research worker. He must be able to separate from the mass of data with which his experience presents him those that can be dealt with on strictly scientific lines. These will, of course, often include the emotional reactions of the patient; but the clinician, in his capacity of investigator, must try to regard them as though they were figures in a sum, or the results of titrations, or steps in an argument. But also, and at the same time, he must do the best he can for his patient, and this means that he must often use measures which, as a scientist, he would regard as based on a very doubtful foundation of ascertained fact. The thing can be done. It *has* been done, and done supremely well by some of the great clinicians. It is of the utmost importance

* Based on an address delivered to the Cambridge University Medical Society on Oct. 23rd, 1935.

to medical science that it should continue to be done well in the future. But it demands a clarity and adaptability of mind of a very high order. I think, also, though here I speak with the greatest diffidence, that this field of work in the future is going to make even greater demands than it did in the past, when so much of the purely clinical territory remained unmapped. I should guess that it will not be easy for the clinical investigator of the future to go very far unless he is a master of some special technique which, in its essence, is non-clinical, though it is applicable to clinical problems. Or, perhaps, it would be truer to say that the man who relies on clinical methods alone—clinical in the restricted sense—will find his field of activity greatly restricted, while the man who has mastered some ancillary technique, chemical, or physiological, or pathological as the case may be, in addition to his clinical training, will find problems in plenty waiting for solution. I do not, of course, mean that he must be a chemist, or a physiologist, in the broad sense, as well as a clinician—that, I suspect, would be an impossibility. But, if he is to work in any of those borderlands that call so urgently for exploration, he should be expert in that limited non-clinical field which he hopes to apply in his clinical studies. Of one thing I feel very sure, clinical research in the true sense will never consist in engaging other people to make a host of tests and examinations, using techniques which one has not mastered oneself, and then trying to add the results together. It is, of course, obvious that there are medical problems that demand for their solution the application of methods drawn from several different branches of science. But the proper method of approach to such problems is the method of team-work—a question that I hope to discuss later. Those who desire a more detailed and authoritative account of clinical research than I can offer should refer to the Huxley lecture given by Sir Thomas Lewis.[1]

LABORATORY WORK IN HOSPITALS

Having ventured over a frontier which, perhaps, I should never have transgressed, I can turn to what is, to me, more familiar ground. The laboratory worker, to use a useful generic label for the multitude of scientific activities that are ancillary to medicine, has fewer demands made upon him than has the research worker in the wards. He is not, in general, responsible for the care, or treatment, of the sick person, and this makes it much easier for him to view his facts dispassionately, and to treat them as data which gain significance only in so far as they add together to form an ordered whole on which at least a tentative conclusion can justifiably be based. But it is clear that the term "laboratory worker" is almost as vague and elastic as "medical research." There are those who work in the laboratories attached to our great teaching hospitals, and even among these there are significant divisions. Of clinical diagnostic pathology I do not wish to say much. A great part of it, in my personal view, belongs to the domain of clinical medicine rather than pathology; for I do not see why the clinician's technical armoury should be limited to the instruments and methods that past generations happened to employ. The clinical pathologist must clearly be at least a competent clinician as well as a laboratory worker—competent in the sense of having an intimate knowledge of disease as it occurs in man, and an ability to weigh clinical evidence, though not necessarily the ability to obtain that evidence for himself.

When we view pathology—including under that term bacteriology and chemical pathology—from the angle of the hospital medical school rather than from that of the ward, the connexion with the sick person, as such, becomes more remote. We are now hardly concerned at all with the fate of Mr. A. or Mrs. B., not at all, in our professional capacity, with their happiness or well-being apart from the particular disease from which they are suffering. Indeed, we never meet them as human beings. In so far as our humanitarian aims and aspirations are concerned we shall not be attempting to cure them of cancer, or tuberculosis, or any other malady, but we shall hope that, through our own efforts and those of the workers who follow us, the time will come when no Mr. A. or Mrs. B. need die of these particular diseases. We shall realise, moreover, that the more we can put the present Mr. A. and Mrs. B. out of our minds, and concentrate on the disease as apart from the individual, the more likely we are to contribute something at least to the solution of our more general problem. Inasmuch, however, as we are still largely concerned with disease in man, we shall need some clinical background, though not so much as the clinical pathologist requires. But, if our requirements decrease in terms of clinical experience, they increase in terms of the basic sciences. More and more is it becoming necessary for the research worker in pathology or bacteriology to possess a sound working knowledge of organic and physical chemistry. Without it, his activities will be very seriously limited.

ACADEMIC MEDICAL WORK

And now we pass to those laboratory workers whose spheres of activity lie in universities or research institutes, instead of in hospitals. They form a continuous series that defies arbitrary division or classification. They range from university departments of pathology, through the departments of physiology, of psychology, of pharmacology, of biochemistry, of biology, of chemistry, of physics, of mathematical statistics, and so on, their immediate relation to disease growing more and more remote, and the number of their workers who are in any way concerned with medical problems growing proportionately fewer and fewer. But remoteness from the centre does not necessarily denote inactivity or unimportance. Sometimes it coincides with a locus of particularly active growth. It does not seem to me unlikely that many of the major advances in medicine will come in the future from branches of science that have no immediate connexion with the prevention or cure of disease. It is a fairly safe guess, because that is the way in which all applied sciences have advanced; and medicine has at least one example it can never forget—the work and life of Louis Pasteur.

It should, I think, be emphasised that there is a significant change in the method of approach as we pass from clinical medicine, through pathology, physiology, and biochemistry to the remoter ancillary sciences—ancillary so far as medicine is concerned. The clinician's problems are inexorably posed for him. He has considerable freedom of selection among them, but he cannot often adapt his problem to his technique, he must try to develop his technique to cope with his problem, and even when this technique is very imperfect he must do the best he can with it. The pathologist again has many of his

[1] THE LANCET, 1935, i., 723.

problems set for him, but his choice among them is freer. There is less urgency in his work. He can neglect altogether those problems that seem to him to offer no hope of solution. He can make free use of animal experiment—indeed, pathology is following physiology in becoming more and more an experimental science—and he can isolate his data and phenomena far more than the clinician can, concentrating, if he chooses, on the study of one particular factor among the many that are involved in any of the manifestations of disease.

When we pass from pathology to physiology—if, in truth, we do pass any frontier beyond a convenient difference in academic labelling—we meet with a further decrease in the part played by the observation of phenomena as nature presents them to us, and a corresponding increase in the part played by controlled experiment. With this change there comes an added freedom to select problems in relation to available knowledge and technique. I need not enlarge on the enormous advantage of the introduction of new technical methods into physiology, or on the advances that have followed the adaptation of chemical or physical methods in the solution of physiological problems. The point to note is that the physiologist, when considering any problem, is free to think mainly in terms of technique. If he can devise a method of attack that offers reasonable hope of yielding a significant answer, he will be tempted to proceed. If he cannot, he will probably select some other problem, rather than work with unsatisfactory tools. I suppose that my physiological colleagues would agree with me that Claude Bernard's words remain as true to-day as they were when written 70 years ago :—

"The prudent and reasonable course at the present moment is to explain all that part of disease which can be explained by physiology, and to leave that part which we cannot so explain to be explained by the future progress of biological science."

Claude Bernard, it may be noted, steadfastly refused to recognise any division between physiology and pathology, beyond that incidental to an arbitrary system of labelling, and I think I may best express his outlook on the relation of experimental science to clinical medicine by a further quotation, which occurs in the same passage of the same book.

"But if, instead of this, some delusive approach of physiology gives rise to the ambition to explain prematurely at one step the whole of the disease, then one loses sight of the patient, one gets a wrong idea of the disease, and, by a false application of physiology, experimental medicine is hindered instead of being assisted in its progress."

That, also, is as true to-day as it ever was.

Is it necessary for the physiologist, or the experimental pathologist, to have any detailed acquaintance with practical clinical medicine? For the moment I would merely note that the necessity is clearly much less than in the case of the clinical pathologist or the morbid anatomist. When we come to the biochemist, the experimental biologist, the chemist without the bio-, and the physicist, we are on rather different ground. In none of these instances is there any reason beyond inclination for the research worker to concern himself with medical problems in any shape or form. If he does so, it will be, or should be, because the knowledge and technique at his disposal are of a kind that are ripe for application to some problem of scientific medicine in its broadest sense. One implication is, I think, obvious. In all these fields the value of a man's contributions to medical research will depend mainly on his ability as a chemist or a physicist. How much medicine must he know, or how much biology? It will be more convenient to consider that question a little later.

I have not, I am sure, exhausted the field of medical research in these brief glances at different parts of it. I have not, for instance, discussed the important subject of psychology, nor the study of the diseases of herds that is the domain of the epidemiologist. But it will, I think, be apparent that the territory covered is of very wide extent; and we should, I take it, all agree that any wise policy that takes the long view must aim at keeping the whole of it healthy, and active, and coördinated.

The Modern Team

This brings us naturally to the question of team-work; and successful team-work is, I believe, the only method that will enable us to advance rapidly and surely. The range of knowledge required for the solution of most of the problems that face us is, I think, beyond the command of any one man, or of any group of men trained in the same technique. The teams will vary in their character and composition according to the particular field in which they are working. At one end of the scale the clinically trained members of the team will be the dominant partners, doing most of the work and seeking help from their non-clinical colleagues. At the other end of the scale there will be teams with no clinically trained members at all. In between there will be every kind of gradation according to the knowledge and technique that each problem demands.

I do not want to give an impression that, in regard to this question of team-work, I am merely painting a picture of what may be in years to come. I am giving a picture of things as they are to-day. In seeking illustrations it is easier for me to take them from the ground I know best—the middle ground where pathology and the basic sciences are both involved, but clinical medicine does not come prominently into the picture.

The two great institutes of medical research in this country—research as apart from teaching—are the National Institute for Medical Research at Hampstead, and the Lister Institute of Preventive Medicine at Chelsea. If you look at the reports of these institutes for last year, 1934, and glance through the degrees and qualifications of the scientific staff and workers, you will note the following figures.

At the National Institute for Medical Research there were 36 workers: of these 13 had a medical degree or diploma, 3 had a veterinary diploma, and 20 had a science degree but no medical qualification.

At the Lister Institute there were 27 workers: of these, 11 had a medical degree, while 16 had not.

Taking them together there were 24 medicals as compared with 39 non-medicals.

The non-medical workers were, in fact, about half as many again as those with a medical qualification. And it should be noted that the non-medicals—mainly chemists and biochemists, with some biologists and a few physicists—were not in any subordinate position, assisting those who happened to be medically qualified with the problems on which the latter were engaged. They included, and include, heads of divisions and departments; and they number among them some of the most distinguished scientific workers in our common field. That is the sort of world into which those of you who decide to devote yourselves to medical research on its non-clinical side, are going; though in university

departments, where the teaching of medical students is combined with research, you will still find a considerable predominance of medically qualified workers.

I have extolled the virtues of team-work; and I have given you my reasons for believing that, for most of us, there is no alternative. But no human system is all virtue and no vice, and teams have their dangers as well as their advantages. The teams I believe in myself are loose, elastic things, easily and naturally modified as need arises, not rigid and ordered, with a set hierarchy of workers. Most members of a team should, I think, be tackling particular problems of their own, as well as those on which the team is engaged, though there may well be a call for whole-time work over a relatively limited period. In any case, I am very sure of one thing, that successful team-work depends on mutual understanding; and mutual understanding, like most things worth having, demands some effort. In this case the understanding that is most required is an understanding of other peoples' technique, including in that term the way their minds work as well as the methods they employ. I do not mean, of course, a knowledge of their methods that would enable one to do their work oneself, but a sufficient acquaintance with the technical processes they employ, and the kind of things they do with them, to enable one to see a problem, if only dimly, through their eyes. To this kindergarten kind of knowledge over the general field there should, I think, be added a deeper knowledge of some limited part of it that lies adjacent to one's own special sphere of activity. We must, I fear, be specialists, but the more overlapping we can manage the better for us all.

A relatively detailed knowledge of some subject ancillary to one's own can be obtained only as a part of a planned educational syllabus; but the more general knowledge can most easily and pleasantly be grafted on a rudimentary training in the basic sciences by personal contacts and informal talk and discussion. These arise naturally among the workers in any research institute, or university department; but they come more easily, and tend to be much more fruitful, if the habit is acquired early in life. You will be missing a great part of what a university has to give if you do not take every available opportunity of discussing scientific problems with your non-medical fellows, whether, at the start, you know anything about those problems or not.

What Kind of Curriculum

And now we may turn to the strictly educational side of our subject, and inquire what kind of curriculum is needed to fit a man to work in the wide and varied field that we have been describing.

THE TIME LIMITS OF CAPACITY FOR LEARNING

Here, again, I must start my argument by raising a question that I am ill-equipped to answer. I gather, from the reports of this year's meeting of the British Association at Norwich, that the capacity for learning does not cease as soon as we had supposed, and that even for the fifty-or-thereabouts there is some hope left. But I gather also that the tests applied were largely memory tests, and the learning of languages. So far as scientific knowledge is concerned, I am inclined to think that, for most of us at least, there is little hope of acquiring facility in a new branch of science after the later twenties. I do not mean that one could not do it if it were possible to drop all other work and devote oneself wholly, for several consecutive years, to learning the new technique, and the facts and arguments derived from it. My feeling is that real knowledge of a science is so much the result of an integration of thought and action that the subject has to be lived with for several years at least before the necessary background can be attained and the new habits of thought acquired. I doubt, for instance, whether any ordinary man can gain a working knowledge of chemistry, or physics, in his spare time, after he has completed his formal education. I know, at least, that my own attempts to gain such knowledge have been ignominious failures.

If I am right in this, and if we accept the not-illiberal view that the average man cannot devote more than six years or so to his whole-time education, counting from the commencement of his university career, then we have those six years to allocate and no more. The research worker will, of course, go on learning all his life, indeed, his learning in this sense will hardly have commenced by the time that his six years are over; but he will be building on foundations that have been fixed during his student years, and he will not usually be able to acquire new, or different, ones.

It is, then, quite useless to plan our curriculum for the medical research worker as though his mind were a limitless receptacle, into which one could pour a large volume of a standard mixture of educational ingredients, leaving room for the addition of more detailed and specialised knowledge of the basic sciences, as and when required. By the time his six years are over he will be an embryo clinician, or physiologist, or chemist, or physicist, or so on. He will be one of these things, not all of them. He may, it is true, have developed along a line that winds across one of these arbitrary frontiers; but if, for instance, he has grafted a general knowledge of physiology on to a basic foundation of chemistry, the lines of his future development will be no less clearly marked.

The Merits and Demerits of Vocational Medical Training

Now it is surely clear that the medical curriculum, as we know it to-day, cannot possibly cope with the educational problem that presents itself. It was never meant to. It was designed, and rightly designed, as a vocational training for men and women who desire to practise medicine, to undertake certain duties to the individual and to the State, and to enjoy the privileges conferred by a registrable qualification. To obtain this qualification, by all but a very few of the available avenues, takes practically the whole of the six years that we have allowed for whole-time study. Let us take the thing as it stands, and see how it meets, or fails to meet, the requirements of the different classes of research workers that we have referred to.

FOR THE CLINICAL INVESTIGATOR

As regards the clinical investigator I have little to say, because I do not know. I should guess, as I have said, that he will gain very greatly by having carried some preclinical scientific subject well beyond the stage prescribed by the ordinary medical curriculum. He will gain in two ways. He will have acquired a knowledge and technique that he can develop and apply in later years, and, what is probably more important, he will have studied some subject sufficiently deeply to have approached the critical stage, and to have gained some insight into scientific method. He will thus attack his clinical

studies with a certain ingrained scepticism, a habit, more or less developed, of sifting evidence, that will enable him to make better use of his years in the wards.

Is this all that is required? I should not venture on an answer; but I may quote from the address by Sir Thomas Lewis to which I have already referred. He says:

"... there is room for a university degree in medical science, which should not include medicine, surgery, or other branch of medical practice as such, but should centre upon disease, as this is studied in human beings; and this degree should be intended to mark those contemplating an academic career."

He is speaking here of a degree in scientific clinical medicine grafted on a modified curriculum that has led to a registrable qualification; and, clearly, a licence to practise is essential for the man who wants to become a clinical investigator. I would ask you, however, to remember his suggestion, which seems to me an eminently wise one, in view of a possible extension of it which I propose to discuss later.

FOR THE PATHOLOGIST AND BACTERIOLOGIST

In regard to the pathologist or the bacteriologist, it is, as I have already said, my firm conviction that he will be at a serious disadvantage if he has not obtained a firm grip on some experimental science before he studies clinical medicine. I suffer from that disadvantage myself and I know what it means. It may be urged that a man does not, in fact, make up his mind that he wants to become a pathologist until he has completed, or almost completed, his medical education. But I fear that in the majority of cases he will then have made up his mind too late, unless he is prepared to spend a year or two learning what he could have learned more easily at an earlier stage in his career. Is it essential that every pathologist in the future should hold a medical qualification? Is it really necessary that he should devote three years out of his precious six to attaining those multitudinous items of knowledge and technique that the General Medical Council and the various licensing bodies demand from those who are going to treat sick men and women? At present there is no escape; and it will, I should guess, always be wise for those who propose to study pathology in close contact with the ward to go through the same educational mill as their clinical colleagues. For the rest of us, whose work lies wholly or almost wholly in the laboratory, I am not so sure. It is true that one tends to undervalue what one has and to yearn for the unobtainable, but I know that I personally would gladly sacrifice much that I remember vaguely from my hospital days for a working knowledge of chemistry.

I believe that the best solution would probably be for some academic pathologists to take a full medical curriculum, while others followed the routes that I am going to suggest as possible alternatives. The research worker is seldom isolated—it is never healthy that he should be—and among groups working in research institutes or university departments it would be all to the good that, even among those who are all labelled pathologists, different workers should have a rather different background. But there must be no differentiation in regard to status or opportunity. By whatever road a man travels all posts, including the highest, must be open to him. At the present time the man who enters the pathological or bacteriological field, even on its academic side, without a medical qualification will find many posts closed to him; and this is a risk that few can afford to take.

FOR THE PHYSIOLOGIST AND BIOCHEMIST

As for the physiologist, those whom I have known were marked as physiologists before they approached a hospital ward and were quite deliberately taking a medical degree as a preliminary to returning to the work of their choice. We know from example that three years in the wards, with a medical qualification at the end of it, is not an essential preliminary to the highest achievement in the physiological field. Is it, on the average, an advantage? I cannot tell. But I am sure that such advantage as there is could be purchased much more cheaply; and an educational waste in one's active learning years is not to be regarded lightly.

The biochemist, in so far as he is concerned with medical problems, I should class with the physiologist, and here again I would note that some of those whose work has contributed most notably to medical science possess no medical degree.

FOR THE CHEMIST AND PHYSICIST

And the others, the chemists without the bio-, the physicists and so on. No one would seriously suggest that they should be forced to take a medical qualification. Their training in their own subjects will take them four years or more before they reach a standard that will enable them to make use of their knowledge in the field of medical research. How are we to provide for them? For many, of course, no provision is required. They will pursue their own careers, lending occasional assistance in our problems when these have reached a stage at which they have become purely chemical, or physical, as the case may be. Medical science can never make provision within its own borders for all its needs. We shall always be asking for help from our senior colleagues in related branches of science. But it is quite clearly desirable that some of those who have mastered the technique and conceptions of one or other of the basic sciences should definitely enter the medical field and make a career for themselves within it. The men we want will not, and I do not think they should, enter this field in any position of permanent dependence on their medical colleagues; but if they have no knowledge of physiology and pathology they can hardly escape that position. Moreover, I do not myself believe that, without that knowledge, they will be in a position to grasp the fundamentals of the problems which their basic training would enable them to attack.

A Short Training in Medicine for the Scientist

Is it altogether premature and absurd to suggest that there is a real need of a training in medicine that will not lead to a licence to practise, nor to a position as a clinical investigator, but will give a student who is already equipped with a sound foundation in one or other of the basic sciences on which medicine is built sufficient knowledge of disease as it occurs in man to enable him to turn his special knowledge to account in the medical field? The training in the wards would, of course, have to be preceded by an adequate training in anatomy, physiology, and pathology—adequate that is for this particular purpose. But is it really sensible to deny to those whose help we badly need any insight into clinical problems, except on the condition that they work through a long and overcrowded curriculum,

and jump a number of examinational fences that were designed for a quite different purpose?

The Ordinary Medical Student

I have in this address said nothing of the man whose future lies in general or consulting practice, or in the administrative field of public health. He falls, I think, into another category. The choice has to be made. You can be a research worker or you can be a practitioner. I do not believe that you can be both. Medical science, if you wish to serve her, demands all your time and energies; so does medical practice. The choice will depend, if you are wise, mainly on your mental reactions, so far as you yourself can judge them. If you let other considerations weigh with you, you will risk all the discomforts of a square peg in a round hole. There are of course no hard-and-fast categories. Some men can be happy and succcesful either way; but some, I think, cannot. There are minds that have a natural liking for searching out unsolved problems and following them through to a finish, or as near to a finish as they can. The problems must be sought or selected, not forcibly presented; and the time and energy required for their solution must not be too greatly encroached on by a host of unrelated activities. Such minds will be profoundly unhappy if placed in an environment in which this unhurried continuous pursuit of some chosen problem is impossible. Medical practice is no place for them. There are other minds that work best under the stimulus provided by some insistent practical need, and that have the capacity of facing a multitude of problems at one and the same time, and enjoying the rush and turmoil of it all. Such minds often suffer boredom if forced to concentrate for long on a question that has no obvious practical issue. Given the requisite skill and sympathy, they will do well in practice; but in the research laboratory they may find themselves on foreign soil. There is no better or worse in it, no higher or lower. It is a question of temperament. No one with any sense of values would attempt to balance the care of the sick against the discovery of new facts about disease. Both are things worth doing, and both need doing well, and with one's whole mind.

I do not mean, of course, that no advance in medical knowledge comes from practising physicians or surgeons; that would be merely absurd. Their contributions have been many and important; but any investigations that they undertake are incidental to their main work, and are therefore determined and limited by it. They have neither the time nor the opportunity to tackle problems of the type we have been considering.

The practitioner's daily work, however, presents him with endless opportunities for observation and for the accumulation of data that can be obtained by no one else. If his observations are properly made, and properly recorded, they may well be of great value, to others as well as to himself. There is, I think, a dangerous fallacy hidden in the conventional division between medical science and medical art. They may be regarded as antitheses. This is entirely false. Some part of medicine is "scientific," in the sense that we are able to apply clear and definite physiological or pathological knowledge in the diagnosis, prevention, or cure of disease. This field is rapidly enlarging, and each enlargement means a corresponding increase in the efficiency of our work. A large part of medicine would, at the moment, fall into the category of "art," in the sense that we have as yet no "scientific" knowledge to apply. But the man who neglected his art whenever scientific knowledge was available would be a very poor practitioner, and the man who does the best he can when facing a practical problem in the light of half-knowledge, or with no "scientific" knowledge at all, relying on his own experience and his own observations so far as they will take him, is a perfectly good scientist. The thing that matters is that he should realise clearly what he is doing. He must use science, when science can help him; and to use it he must have a working knowledge of it. Above all, he must avoid pseudo-science like the plague; and that is not always easy. The scientific outlook, in this, which is its true sense, is just as important in practice as in research.

The Curriculum Leading to Medical Practice

I emphasised at the beginning of this address that I was discussing the medical curriculum as it affects the future research worker. In closing, I should like to make it equally clear that I am not suggesting that this is the angle from which the problem of future changes in that curriculum should be approached. It would be absurd, in considering any possible reforms, to allow the interests of that small band of men and women who intend to devote themselves to the academic side of medicine to weigh against the interests of the great mass of students whose future lies in practice, or in the administrative field of public health. All that I have done is to stress the importance, to the future research worker, of making full use of the preclinical years, and to suggest a possible avenue by which we might bring into the medical field research workers in other branches of science, whose entry as full partners is rendered difficult or impossible by our present system. If I were tempted to offer any suggestion as to the reform of the medical curriculum as a whole it would be that it needs a greater elasticity and some degree, at least, of differentiation. Apart altogether from the special needs of medical research, I do not myself see how a single rigid curriculum can possibly provide for the training of all those practitioners, specialists, semi-specialists, and medical administrators on whose activities the prevention and treatment of disease depends. There is, of course, a rapidly growing system of post-graduate diplomas and degrees that serve to train men and women for specialised medical activities, and these will certainly become more and more important in the future; but there must be some limit to the total curriculum. If something could be done to lighten the general burden, to reduce the number of facts and the range of technical knowledge that have to be mastered by every medical student, so that he had a little time in which to think, it would, I believe, be a very great advantage to the profession as a whole. I have already referred to the suggestion of Sir Thomas Lewis that a modified and shortened medical curriculum might be followed, for those who wish to become clinical investigators, by a special course in scientific medicine. Could not this process of simplification and elimination during the earlier clinical years, with differentiation during the last year or so, be considerably extended, to the advantage of all concerned? But such questions as these lead inevitably to a consideration not only of medical education but of the whole organisation of medical practice, and I have neither the time nor the courage—perhaps I should say the bravado—to enter on so thorny a field of debate.

SCOTLAND

(FROM OUR OWN CORRESPONDENT)

MATERNAL MORTALITY IN SCOTLAND

In spite of the fact that some six months have elapsed since the publication of the report by two medical officers of the Department of Health for Scotland as the outcome of an inquiry into maternal mortality and morbidity in Scotland resentment is still being expressed by general practitioners here at what they regard as criticism of their midwifery. It will be remembered [1] that the report analysed the circumstances attending the deaths of 2527 mothers in childbirth, and estimated that 58·7 per cent. of these could have been avoided; 37·1 per cent. were attributed to some faulty technique of the attendant, including doctor, midwife, and institution in this category, and 21·6 per cent. to the failure of the patients to obtain advice or to follow the advice given. A circular is now being issued to all county and town councils in which the Secretary of State for Scotland urges them to consider in what directions the maternity services of their area may be improved. As a first step he suggests that a survey of the local maternity services should be completed by Feb. 29th, 1936. The circular also recommends local authorities to take immediate effective action on certain of the recommendations contained in the report, particularly as regards the provision of antenatal services, and to consider whether and on what conditions the services of obstetricians would be made available to general practitioners for consultative purposes.

VOLUNTARY HOSPITALS

At a meeting shortly before Christmas, Sir John A. Roxburgh, chairman of the Western Infirmary, Glasgow, described the voluntary hospital system as "a priceless possession." It would be a calamity, he held, if the voluntary principle could not be maintained and developed. Much could be done to maintain it by coöperation with the public health authorities. The chairman of the Royal Hospital for Sick Children, Glasgow, said that voluntary hospitals were entitled to State recognition and State protection so long and in so far as they continued to function efficiently. The voluntary hospitals recognised that they could not provide all the hospital services required, and were prepared to coöperate cordially with the rate-aided hospitals. Recent demonstrations of the confidence felt by Scottish people in this system are not lacking. The trustees of the estate of the late Mr. George Cuthbertson, shipowner, Glasgow, have announced that a sum of £116,000 will be allocated to various hospitals, churches, and other charitable bodies in Glasgow. The Glasgow Royal Infirmary and Glasgow Western Infirmary receive respectively £10,000 and £9000.

A Government commission is now sitting in Edinburgh to consider the whole subject of the health services of Scotland.

DISPENSARY SERVICES IN GLASGOW

The remarkable increase in the popularity of the dispensary services of Glasgow during this century is the more striking when we realise that this period has seen many additions to the avenues through which medical advice may be sought. Dr. A. K. Chalmers, in an interesting analysis contributed to the *Glasgow Herald*, attributes the flock of attendances at the dispensaries partly to the present drift towards the institutional treatment of disease, and partly to the gradual reduction in the numbers of the fee-paying classes. The figures of attendances at 13 of the principal dispensaries indicate that over 300,000 "first attendances" and "new cases," and over a million attendances were made during 1934. The attendances in the year 1901 were less than a third, and in the year 1911 little more than half those in 1934. Dr. Chalmers estimates that a population of about 1,704,000 is now served by the dispensary services in Glasgow. There is unfortunately a lack of coöperation between the dispensary physician and surgeon and the family doctor—a large proportion of the dispensary clientele coming to the dispensaries without any medical reference, and Dr. Chalmers fears that this tendency will impair the efficiency of both private and consulting practice.

PHYSICAL EDUCATION IN SCHOOLS

At the annual congress of the Educational Institute of Scotland, recently held in Glasgow, Dr. J. Jardine read a paper on physical education. Referring to intelligence tests, he said that while these had been of great service in educational classification, they provided only rough estimates of a child's natural capacity. No tests at present devised could differentiate temperamental manifestations or suggest a reason why one child was unstable and another stable. Dr. Jardine held strongly that the biological needs of the child should receive first consideration. He deplored what he described as the atmosphere of tension in the primary schools; large classes resulted in strain upon the teacher, and, through him or her, upon the children. Any system of education which demanded that the whole school day and all the evening should be given over to set tasks of an intellectual character was to deprive the child of its biological rights.

[1] See THE LANCET, 1935, ii., 159.

IRELAND

(FROM OUR OWN CORRESPONDENT)

A NATIONAL HEALTH INSURANCE BILL

On Dec. 18th, 1935, Mr. Sean T. O'Kelly, Minister for Local Government and Public Health, introduced a Bill to amend the National Health Insurance Acts and also the Widows' and Orphans' Pensions Act. The text of the Bill has since been made public. As concerns National Health Insurance two important changes are proposed. One has to do with the method of electing a committee of management, and the other is the bringing of soldiers of the permanent force and members of the reserve force into the scope of National Health Insurance as if they were in the sole employment of the Minister for Defence. At present the Unified National Health Insurance Society, which includes all the previous approved societies, is governed by a provisional committee of three persons appointed by the Minister. This provisional committee was to exist for three years from the coming into force of the National Health Insurance Act of 1933, and was then to be replaced by an executive committee of fifteen to be elected by the insured persons. The effect of the present Bill will be to establish a different method of appointing the executive committee than that contemplated by the Act of 1933. The committee will consist of fifteen persons, but it will not be elected by the insured members. The chairman will be appointed by the Minister, who will also appoint

three persons to represent employers; the Trades Unions Congress will nominate three members; five will be elected on behalf of the insured by an "electoral college" made up of persons nominated by the local authorities on behalf of the insured in their several areas; the committee will be completed by the inclusion of the three trustees for the time being of the Unified Society.

MASTERSHIP OF THE COOMBE HOSPITAL, DUBLIN

Dr. Robert H. J. Mulhall Corbet has been elected master of the Coombe Hospital in succession to Dr. T. M. Healy, whose term of office had expired. Dr. Corbet is a graduate in medicine of the University of Dublin, and a fellow both of the Royal College of Physicians of Ireland and of the Royal College of Surgeons in Ireland. He has been assistant master both of the Rotunda Hospital and of the Coombe Hospital. The term of office as master is seven years, and it is hoped that during the tenure of the new master the hospital will move into a modern, completely equipped building.

UNITED STATES OF AMERICA

(FROM AN OCCASIONAL CORRESPONDENT)

EMERGENCY TREATMENT OF ACUTE ALCOHOLISM

Drs. L. S. Robinson and Sydney Selesnick who have to treat about 700 alcoholic patients yearly in the fifth medical service of the Boston City Hospital have devised a very rational and apparently successful method of treating the more severe cases of acute alcoholism that show coma, stupor, drowsiness, or ataxia. Study of the literature shows that the administration of carbon dioxide increases the respiratory excretion of alcohol, while administration of oxygen will save the life of rabbits that have received a dose of alcohol lethal to the controls. There is evidence that the oxygen is effective rather by speeding the oxidation of the alcohol than by relieving oxygen-want. The Boston doctors therefore have administered a mixture of 10 per cent. carbon dioxide in oxygen through an open slot mask. Blood chemistry observations were made before administration and after 30 minutes' inhalation of the mixed gases. The alcohol content of the venous blood was found to diminish more rapidly in treated patients than in controls. No carbon dioxide retention resulted from the treatment. The high lactic acid content of the blood of alcoholics was found to be unaffected by the treatment. Clinically the results were encouraging. Respiration became deep and regular almost at once. The patient changed rapidly from a cyanotic cold person to a pinkish warm one. After half an hour he would breathe normally left to himself; also he could be aroused by painful stimuli. The treatment is recommended not as routine but as emergency treatment of acute alcoholism where danger of paralysis threatens life.

SURVIVAL OF MICRO-ORGANISMS AT LOW TEMPERATURES

The increasing consumption of frozen fruits and vegetables in this country lends interest to observations made by the Bureau of Plant Industry (Dept. of Agriculture) on survival of micro-organisms at low temperatures. Twenty-six species of bacteria, yeasts and moulds were isolated from fruit that had been stored for three years at 15° F., and were transplanted to freshly made beef infusion agar adjusted to pH 7·0. These slant cultures were placed in the 16° cold-storage room at the Arlington Experiment Farm. After three months definite growth even at this low temperature was found to have occurred in three of the transplants—all of them yeasts. Between five and seven months growth was observable in five more cultures. At the end of a year all cultures were brought into the laboratory, allowed to thaw out, and incubate at room temperature. All but 5 of the 26 species showed an "exceptionally large amount of characteristic growth" in 24 hours.

PARIS

(FROM OUR OWN CORRESPONDENT)

THE CAMPAIGN AGAINST VENEREAL DISEASE IN GRENOBLE

Dr. Butterlin, who is in charge of the venereal disease service of the Department of the Isère, gives an encouraging account of the progress effected in this Department since the introduction of a minor revolution in the control of prostitution and the provision of free treatment. While most of France continues to cherish hopes of the efficacy of official medical control of prostitution, the authorities of Grenoble have broken with this tradition and, after suppressing prostitution as a State-regulated profession, have provided a central venereal disease service in Grenoble itself, and five branches of this service in other parts of the Department. The Grenoble service assures the strictest secrecy and is open every evening, with one section for men and another for women. The treatment given on the spot is controlled by serological and bacteriological examinations undertaken by the Department's medical staff. Dr. Butterlin's statistics for the past six years show that, with a great rise in the number of attendances, there has been a fall in the number of new cases of syphilis and chancroid. During these six years the annual number of attendances has risen from 7000 to 27,300. In 1929, 79 syphilitic chancres were observed. This figure rose to 144 in 1930, and fell in 1931 to 115. The corresponding figures for the next three years were 38, 30, and 41. The decline in the number of chancroids seen has been even more dramatic; from 1924 to 1929 some 15 to 25 such cases were seen every year, but during the last two years chancroid has disappeared more or less completely. The figures for gonorrhœa are less encouraging, presumably because of the notorious difficulty of diagnosing early and treating effectively the gonorrhœa of women.

THE DEATH OF PROF. WALTHER

Prof. Charles Walther, who died just before Christmas, packed into his long life most varied activities, although he was always the scientific surgeon. He brought to his studies a methodical and logical mentality which marked his actions whether they concerned research, operative technique, or administration. He was professor in the Paris faculty of medicine, chirurgien honoraire des hôpitaux, president of the International Surgical Association, and Grand Officer of the Legion of Honour. He received the Croix de Guerre for his wartime services which included the administration of two important surgical centres in Paris (the Val-de-Grâce and the Pitié). In 1918 he was elected member of the Academy of Medicine, and until 1934 he was a familiar figure in the chair at its meetings. He had much to do with the introduction of the practice of swabbing the field of operation with tincture of iodine, and he made important contributions to the study of appendicitis, nerve lesions, cancer of the tongue, and local anæsthesia with cocaine.

OBITUARY

WILLIAM COLLIER, M.D. Camb., F.R.C.P. Lond.

Now and again there appears in a city a man whose life and work make an enduring impression, who possesses that mysterious quality, prestige, a quality which depends not upon worldly success or professional acumen, but upon a subtle combination of ability and personality associated with a disinterested devotion to ideals of conduct and leadership which distinguish him from his fellow men. Such a man was Dr. William Collier, whose death on Dec. 21st is deeply mourned by all in Oxford who knew him as friend, physician, or colleague.

Collier's was an interesting life and a chance contact was responsible for his adoption of the profession which he subsequently came to practise and adorn. The youngest of five children of Henry Collier of Stapleford, Cambridge, he was born in 1856, and after passing through Sherborne School he entered Jesus College, Cambridge, without any clear idea as to his future. The spirit of adventure which was a feature of his whole career led him to give up his academic course and to join an expedition to explore the possibilities of flooding the Sahara. In the preliminary reconnaissance by sailing ship of the northern coasts of Africa, Collier was afflicted by such disastrous sea-sickness that he was compelled to abandon the venture, being landed penniless at Teneriffe. Having recovered his strength he attempted to secure a return passage by a ship sailing for England, but the captain—a cautious Scot—refused a cheque, and Collier was sent ashore. From this dilemma he was extricated by a passenger who voluntarily produced the passage money and Collier returned to England and Cambridge. Here by chance he met Sir George Murray Humphry, whose advice to control his enthusiastic and adventurous spirit came to Collier as something of a shock. Humphry suggested medicine as a possible career and this advice was followed, Collier taking a pass degree, all that was possible to him after the interruption of the African adventure. His wise counsellor retained a keen interest and friendship for the young man in after years.

DR. COLLIER

At King's College Hospital Collier acted as dresser to Lister who had come to London in 1876, and on qualification (in 1880) he took up the post of house physician and pathologist at the Wolverhampton General Hospital. A short experience followed in a fashionable practice in Hastings, which he found distasteful and he gladly presented himself for the post of house physician to the Radcliffe Infirmary, Oxford, to which post he was appointed in 1881, being elected a physician to the hospital in 1885, and in this year he obtained his M.D. Cambridge. In 1886 he obtained the membership of the Royal College of Physicians to which he was elected a fellow in 1892. As a physician and teacher, while conducting his own practice, he built up a reputation as a consultant among his colleagues both in the city and county, his work being distinguished by a wisdom, sympathy, and sound judgment which were characteristic of his matured outlook on life. As a proof of the high esteem in which he was held by his colleagues he was presented, in 1929, with his portrait painted by the Hon. John Collier, an exceptionally successful likeness which is reproduced with this obituary notice.

An enthusiastic, vigorous, and far-sighted promoter of many schemes for the reform of professional, hospital, and social services, Collier was a generous opponent, quick to grasp another's point of view, and with a sense of humour which never deserted him in debate or intercourse. He once said of himself that he "had never hated any man," a rare attribute in a man who was a determined fighter in any cause which he had taken up, but an observation to the truth of which all who knew him will subscribe. One very important service which he rendered to the Radcliffe Infirmary was the successful organisation of the 2*d*. Contributory Scheme in 1920, the first of its kind in a county rural district, a scheme which in the past year has produced over £40,000 towards hospital services in the area. In a long, active, and useful life Collier held many posts of distinction and lived to see many of his ideas realised in practice; his memory and his keen interest in people and affairs he retained to the end, and his remarkable physical activity is evidenced by the fact that at the age of 75 he ascended the Pillar Rock in Cumberland.

Dr. Collier married Anna, daughter of the Rev. Dr. James Legge, first professor of Chinese in the University of Oxford. His widow and two daughters survive him. Of his two sons one, Dr. W. T. Collier, M.C., F.R.C.P., physician to the Radcliffe Infirmary, died at the age of 43; the other, Lieut. Martin Collier, R.N., lost his life during the war. A daughter, Dr. Ivy Collier, died in 1927. F. G. H.

ARCHIBALD STANLEY PERCIVAL, M.A. Durh., B.Chir. Camb.

CONSULTING SURGEON, NEWCASTLE-UPON-TYNE EYE HOSPITAL

THE death occurred on Dec. 22nd at Shenley, Woking, of Mr. A. S. Percival, the ophthalmic surgeon who for some 30 years was a leading authority on many aspects, especially the mathematical ones, of his specialty.

The son of Mr. Stanley Percival of The Hermitage, Woking, he received his preliminary education at Repton, proceeded to Trinity College, Cambridge, as a science scholar, and graduated in 1884 with a first class in the Natural Sciences Tripos. He went to St. George's Hospital for his clinical training, graduated as M.B., B.Chir. Camb., and held various house appointments, including that of house surgeon at the Royal Westminster Ophthalmic Hospital. His experience there determined his future career, for shortly afterwards he was appointed ophthalmic surgeon to the Children's Hospital, Newcastle-on-Tyne, and in Newcastle he practised as ophthalmic surgeon until his retiremeut in 1928.

Percival was from the very beginning of his career attracted by the mathematical side of his specialty, and although all his elaborate work was in his own intention directed towards the improvement of

clinical methods and the smoothing away of difficulties both in diagnosis and treatment of ophthalmic disorders, his contributions to the subject assumed for their comprehension a mathematical knowledge and perception denied to most clinicians. Percival was always unaware that there are people who cannot read and detect at a glance the significance of elaborate equations, but his writings were mostly confined to the special journals, where the appeal was to an instructed audience. He contributed to the *Archives of Ophthalmology*, to the *Ophthalmic Review*, to the *British Journal of Ophthalmology*, as well as to the *Transactions* of the Ophthalmological Society articles on bifocal lenses and the action of prismospheres and decentred lenses; on the action and uses of prismatic combinations; on periscopic lenses; on the correction of astigmatism by tilting spherical lenses; on colour phenomena; and on decentration and oblique cylinders. To the *Transactions* of the Northumberland and Durham Medical Society he was also a frequent contributor, writing on convergent and divergent squint, errors of refraction in relation to headache, and faulty tendencies of the ocular muscles.

In 1899 he wrote his first book entitled "Optics, a Manual for Students" which showed him immediately as an original worker along the mathematical side of optics, the attempt being to arrive at the knowledge of the laws underlying observed phenomena and to devise means for the attainment of certain results. Here Percival was a direct follower of Isaac Newton, and his manual, although by the implication of its title directed to students, was really an advanced mathematical treatise going far beyond the ordinary restrictions of algebra and geometry observed in any teaching text-book. For example a knowledge of the properties of caustics is essential to a due comprehension of the theory of optical instruments, and for spherical reflectors most of those properties can be studied in the generating epicycloid. With this object the reflector is usually referred to rectangular coördinates, the first differentials of which define the position of the reflected ray and the second differentials the locus of the intersection of two consecutive rays. Percival materially simplified this complicated part of the subject by a new and ingenious application of mathematics. He published in 1913 a short volume, entitled "Geometrical Optics," which may be regarded as an expansion and simplification of the more elementary chapters of the earlier treatise, and those students who had the necessary grounding, or were not discouraged by the abundance of algebraic symbols, were rewarded by a conception of the optical problems of ophthalmology which might be of high value in ophthalmoscopic work and the correction of refractive errors. He also wrote a useful treatise on practical integration, and an elementary work on the principles of perspective in drawing.

Mr. Percival retired from practice eight years ago, returning to his native town of Woking. He married Winifred, the daughter of the late Mr. William Warner, who predeceased him by many years.

FREDERIC HIBBERT WESTMACOTT, C.B.E., B.Sc. Vict., F.R.C.S. Eng.

Colonel Westmacott, who died in Manchester on Dec. 20th, was a man of striking personality. His native town, which knew him as "Freddie" Westmacott, noted his love for the military side of medicine, and for the law and order which goes with it, and will miss his presence much. Had he devoted himself entirely to the Army medical services he would have risen to high position, but otology and Manchester would have been poorer.

Related to Richard Westmacott whose sculpture of the Good Samaritan adorns the seal of the Manchester Royal Infirmary, Frederic Hibbert Westmacott was born in 1867 at Crumpsall Grove, Manchester. Educated at the Grammar School and at Owens College, he qualified in 1890 and became F.R.C.S. Eng. four years later. His early clinical experience was acquired at the Royal Infirmary, the Children's Hospital, Pendlebury, and the Barnes Convalescent Hospital, Cheadle. Then for a time he travelled in the East, going out on the Bibby Line s.s. *Shropshire* and joining in the Burma Expedition, for which he earned the first of his many military medals. Before returning to Manchester, having decided to adopt otology as his specialty, he spent a year in the aural clinics of Vienna; in his early days he was hampered for want of hospital beds, until in 1913 he became assistant aural surgeon to the Royal Infirmary, succeeded Sir William Milligan in 1924, and retired in 1927 on reaching the age limit. He held other posts at the Pendlebury Children's Hospital and St. John's Hospital. After retiring from hospital work he carried on a busy private practice, recently spending some of the winter months at Monaco. For the last few years his health had declined, although he was unwilling to save himself as he might have done

COLONEL WESTMACOTT

[Photograph by F. W. Schmidt

Westmacott's military life started as a private in the (then) 2nd volunteer battalion of the Manchester Regiment, later he was transferred to the local R.A.M.C., becoming surg.-lieut. of that corps. At the outbreak of war he was registrar of the local territorial hospital, the 2nd Western General. A year later when J. W. Smith relinquished the post he became officer in charge and spent his time between this hospital and the 57th General Hospital which served in France and Italy. He was for some time A.D.M.S. at Marseilles. The size and importance of the 2nd Western, to a large extent a product of Westmacott's energy, may be realised from the 235,900 patients admitted during the war, the 107,801 medical boards held there, and the 75 medical officers who were attached to it in addition to 27 civil practitioners. In 1920 he was appointed A.D.M.S. to the reorganised 42nd (East Lancashire) Territorial Division. His quick grasp of a situation, his sense of what might be improved and how to do it, combined with his mastery of ritual never left him at a loss whether in his masonic or his military work. His capacity for enforcing obedience was a by-word and his organising capacity was seen at its best as chairman of the entertainments committee when the British Medical Association visited Manchester in

1929. It was during the work of that eventful week that he had a heart attack which made many of his friends anxious.

He received many honours. The one that he appreciated especially was that of honorary surgeon to the King conferred in 1927. He was deputy lieutenant of the County of Lancaster, and Knight of Grace of the Order of St. John of Jerusalem. He was appointed C.B.E. in 1919. In 1904 he married Margaret Carlota, third daughter of Alexander Howden, who survives him.

An old friend writes: "Though holding decided views which he did not hesitate to advocate forcibly yet his obvious sincerity and his genial manner assisted in overcoming opposition, so that Westmacott usually succeeded in obtaining his own way. A dogged perseverance obtained most of the objectives upon which he had set his heart. His career as a medical student had not been brilliant and fellow students smiled when he announced his intention of taking the F.R.C.S., yet after a slight disappointment at the primary examination he confounded his critics by passing the final at the first attempt. Another goal he desired was to be A.D.M.S.—the highest office in the A.M.S. attainable by a non-regular—and in the later years of the war he was appointed A.D.M.S. to the Marseilles area and the 42nd Division. He was undoubtedly a great organiser and administrator, first as registrar and O.C. of the 2nd General Western Hospital and afterwards as O.C. of the 57th B.G.H. in France. His knowledge of French and German proved most useful in the early days of the 2nd Western, when so many wounded Belgians and German prisoners-of-war were admitted. His organisation of entertainments at the B.M.A. Manchester meeting of 1902 was so well remembered that in 1929 all the committees dealing with entertainments and transport were combined under his chairmanship. First-aid and ambulance work always had a great attraction for him; his experience as a judge of competitions between ambulance teams must have been unique. Westmacott had many social interests and engagements into which he entered with untiring energy. He enjoyed life to the full and will be sadly missed by a wide circle of friends."

ARTHUR EDWARD GILES, M.D., M.R.C.P. Lond., F.R.C.S. Edin.

CONSULTING SURGEON, CHELSEA HOSPITAL FOR WOMEN

WE regret to announce the death at Welwyn, Herts, on Dec. 26th, of Mr. A. E. Giles, the well-known surgeon and gynæcologist.

Arthur Edward Giles was the son of Mr. Samuel Giles of Bombay, where he was born in 1864. He had a varied preliminary education, being a student at the City of London School, the Havre Lycée, and the Manchester Grammar School, while he completed his medical training at Owens College, Manchester, where he entered in 1883. At Owens College he was Platt physiological scholar; he graduated as M.B., Ch.B. Vict. in 1888, and M.B. Lond. in 1891, securing first-class honours in obstetric and forensic medicine. In 1892 he proceeded to the M.D. Lond., qualifying for the gold medal, and then undertook a long course of post-graduate work in Berlin, Vienna, and Paris. In 1893 he took the diploma of M.R.C.P. Lond., and a little later that of F.R.C.S. Edin. After holding residential posts at the Manchester Royal Infirmary and the Crumpsall Hospital, Manchester, and the General Lying-in Hospital, Lambeth, Giles secured in succession appointments to the staffs of the St. Pancras and Northern Dispensary, the Chelsea Hospital for Women, the Prince of Wales's General Hospital, Tottenham, and the Marylebone Dispensary, and by his strenuous and enthusiastic work he made for himself a prominent position as a gynæcological surgeon. His connexion with the Chelsea Hospital for Women was a very long and valuable one. He was elected on the staff of the institution as assistant surgeon over forty years ago, and was consultant surgeon at his death. Through his work here he became a recognised authority on the technique of gynæcological surgery—possibly not so widely recognised as he deserved, for he was a great clinician.

As a writer Giles at the earlier stages of his career was profuse but practical. He wrote the article on gynæcological operations in Carson's "Operative Surgery," and that on hysterectomy in Eden and Lockyer's "System of Gynæcology." It would serve no purpose to enumerate the many clinical articles which he contributed at various times to our own pages and those of our contemporaries, but the communications generally arose from experiences in his varied institutional practice and had the stamp of personal knowledge. Early in his career he participated with Sir John Bland-Sutton in the production of a book which ran through some nine or ten editions and the teaching of which is still essentially sound. This book—the "Diseases of Women, a Handbook for Students and Practitioners"—set out to relate facts and describe methods in connexion with gynæcology in such a way that students might find the information valuable in their training and practitioners realise the advantages to their patients that followed prompt and proper surgical treatment. The book laid itself open, despite its title, to being largely a manual of operative surgery, so slight was the stress laid on the value of medical treatment, and in other directions did not meet with universal approval, but the personal opinions were honestly given, and the teaching, within its limitations, was seen to be sound.

MR. GILES

[Photograph by Bland

In recent years Giles took a deep interest in two subjects loosely related to each other—namely, the occurrence of sterility in woman and the need for medical teaching on birth control. In a short book on sterility Giles summarised much of the accepted knowledge on the matter, and attempted to determine the percentage of cases in which where a marriage had been sterile the fault lay with the male. He was only able to show, however, how difficult it must be to arrive at any certain conclusions, though he thought that the husband might be at fault in from 10 to 50 per cent. of the cases, a figure which clearly has little informative value. He estimated that the proportion of sterile marriages in this country

in the era succeeding the war was 10 per cent. for the working population and 16 per cent. for the leisured classes, and he closed his monograph, which contained a number of original observations, with a pathological and clinical classification of the causes of the condition. His views on birth control were made known in an address delivered before the Manchester Medico-Chirurgical Society (vide THE LANCET, 1927, ii., 165) in which the medical and gynæcological grounds for birth control were adequately set out and a clear description was given of the methods to be adopted. His general conclusion was to the effect that birth control being a necessity in certain circumstances, and expedient in a few cases, the medical profession should lay down its indications and point out its limitations.

During the war Giles served with the rank of major in the R.A.M.C., and was surgeon in charge of the Anglo-French military hospital at Tréport in 1915, and civil surgeon to the Hampstead military hospital in the following years. At Tréport he suffered from an acute septicæmia following an accidental wound while operating at Lady Murray's hospital. At the close of hostilities he went to live at Welwyn, where for many years he had had a week-end cottage, and was already consulting surgeon to the Queen Victoria Cottage Hospital. His skill as a surgeon and his unvarying kindness and courtesy to the patients greatly increased the utility and reputation of this small institution, and to the end of his life he took an interest in its working. While he still practised from his London address he lived in Welwyn, and was at the beck and call of the whole community in a consulting or operative capacity, going to the hospital at any hour of the night in response to calls. The new building of the hospital was opened in 1934 by the Duchess of York, and he performed the first operation which took place in its wards. And when he became ill only shortly before Christmas he entered a private ward of the hospital and died there on Dec. 26th, mourned by the whole neighbourhood.

Giles was consulting gynæcological surgeon to the Prince of Wales's Hospital, to the Chelsea Hospital, and the Sutton and Wood Green Hospitals. He had served as president of the section of obstetrics and gynæcology in the Royal Society of Medicine, and was a vice-chairman of the council of the East London Hospital. He was a past master of the Drapers Company, and music was among his wide interests; one of his compositions was played recently at a conversazione at the Royal Society of Medicine. He married May Hartree, daughter of the late Mr. A. A. Tindall.

MEDICINE AND THE LAW

Agranulocytosis and Amidopyrin

AN inquest on another case of suspected agranulocytosis was held at St. Pancras Coroner's Court on Dec. 27th, within a week of that recorded in our last issue. The victim was a man aged 47 who had been in poor health for two years and had been treated for fibrositis by diathermy, but not, according to his widow, by drugs until two months ago when he had bought a bottle containing 100 five-grain tablets of Novalgin. Between them husband and wife had consumed 91 tablets, the husband accounting for about 60. The widow said that she had not mentioned the tablets before because she did not think that the drug had anything to do with her husband's symptoms—i.e., shivering and sore-throat. Sir Bernard Spilsbury said that the microscopical changes in the body were remarkably like those of the previous case, but that it was difficult post mortem to prove any effects upon the blood. The striking absence at the autopsy of any marked change in the organs had made him suspicious. He was now satisfied that death was attributable to the drug. The coroner, Dr. Bentley Purchase, said that from the beginning the case had struck him by its similarity to the other, but it was not until the widow had mentioned novalgin that any connexion was revealed. Pyramidon and novalgin, though differing in their constitution, contained a common chemical group (pyrazolon). He again emphasised that though this type of drug was valuable its use needed great care; he proposed to refer the case to the Poisons Board and returned a verdict of death by misadventure.

Sale of Dentist's Practice

The sale of a dentist's practice in Wimpole-street has raised a doubtful point of income-tax law. The purchase agreement specified a "primary" price of £15,000, subject to variation as subsequently explained. Of this sum £5000 was to be paid forthwith; the purchaser was to pay the balance by annual payments over the next ten years in the form of 25 per cent. of the net profits of the year; these ten-year payments were to increase or diminish the "primary" price of £15,000 according as they came to more or less than £10,000. They were to be regarded as capital sums paid in respect of the purchase price. This arrangement gave the buyer the advantage that he would be paying according to the actual value of the practice. He sought the further advantage of deducting these annual payments from income for the purpose of his super-tax returns. In a particular tax year the payment turned out to be £886. He claimed that this was in the nature of income and not a capital sum, and that it could therefore be deducted in ascertaining his own taxable income. The Special Commissioners agreed and allowed the deduction. So did Mr. Justice Finlay. The Court of Appeal, however, took a different view last month. The Masters of the Rolls said the question was whether the purchase agreement contemplated the payment of a sum of money (payable in instalments or otherwise) or an annuity. The agreement fixed £15,000 as the purchase price from beginning to end; the ten-year percentage payments might have the effect of varying the total of this lump sum, but they did not alter the legal position. They were not annuities but instalments of a definite lump-sum price. It followed that the £886 could not be treated as income. It was capital and it could not be deducted from income for purposes of super-tax return. And now the experts who assist professional men over the purchase of a practice will perhaps turn back to the idea of payment in the form of annuities. It will depend on whether they are advising a prospective buyer or a prospective seller. The seller in the Wimpole-street case would probably have been surprised if income-tax had been claimed from him on the instalments of the purchase price.

ROYAL PORTSMOUTH HOSPITAL.—Over £79,000 has been spent upon extensions to this hospital. Subscriptions received during the year amounted to over £7000 bringing the total sum collected to over £75,000, while about £10,000 more has been promised. Three of the wards of the new block have been in occupation for some months.

CORRESPONDENCE

ROYAL MEDICAL BENEVOLENT FUND

To the Editor of THE LANCET

SIR,—I have once more the pleasant duty of thanking you for the help you have given the committee of the Royal Medical Benevolent Fund in respect to the Xmas gifts for our beneficiaries.

The response of our medical brethren has been very prompt and generous, the amount raised is £819 4*s.* 3*d.*, an increase of £148 9*s.* over last year.

The replies of the beneficiaries are, many of them, pathetic, indicating how this gift has been most useful in respect to fuel, and other Xmas comforts.

Believe me,

Yours sincerely,

Wimpole-street, W., Jan. 1st, 1936. THOS. BARLOW.

PAIN AND EUTHANASIA

To the Editor of THE LANCET

SIR,—You have been admonished by Dr. Piney for opening your columns to the discussion of voluntary euthanasia. There is little doubt that the general practitioner, on whose shoulders falls the responsibility of seeing these unfortunate patients through the penultimate stage of their illness, and who can speak with authority on the matter, is deeply interested in the subject. There is, moreover, a large section of the lay public who read THE LANCET and look for intelligent guidance from medical men on a subject which concerns the community as a whole.

Mr. Bankart and Prof. Rogers remind the medical profession of another palliative measure to relieve pain, namely, chordotomy, but all practical surgeons are familiar with this procedure, and equally familiar with the extremely limited scope of this operation. Their reminder is given with a bland assurance which is apt to mislead, and to leave the impression that with chordotomy the problem is solved. Only too well we know that for cancer of the tongue and pharynx, of the thyroid and larynx, and of that terrible disease, cancer of the œsophagus, chordotomy is impracticable.

There is a widespread belief that incurable and lingering cases of fatal disease are ministered to by trained and sympathetic nurses and by every resource that can be devised by medical science in hospitals or homes for incurables. The hideous truth is that the majority of these cases are discharged from hospital and terminate their pitiable existence in working-class homes or even in slum dwellings. Even in hospitals, when all cases which can be given effective palliative treatment have been discounted, there still remains a residuum, for whom alone this Bill is designed, the relief of whose sufferings is beyond the skill of our profession.

The root of the matter is not the mental distress of relatives, nor the abstract conscientious scruples of those who are not themselves suffering pain; it is for these cases, which are alleged to be few in number, that a method of escape from intolerable pain of body and distress of mind is sought. How few or how many these cases may be, remains to be seen, but I suggest that the testimony of the family doctor is the most valuable on this point. It is marvellous with what equanimity we bear the misfortunes of others, comforting them with the spectacle of the Thief on the Cross, the duration of whose sufferings, by the by, was measured in hours not in weeks or even months, and whose punishment for his crimes was in accordance with the code of justice that obtained 2000 years ago.

I am, Sir, yours faithfully,

H. H. GREENWOOD,
Member of the Consultative Council of the Voluntary Euthanasia Legalisation Society.

Swindon, Dec. 30th, 1935.

LORD NUFFIELD'S GIFT

To the Editor of THE LANCET

SIR,—Lord Nuffield, it will be remembered, has already done great things for cripples. First came his magnificent gift of £70,000 for the rebuilding of the Wingfield-Morris Orthopædic Hospital in 1933; then early in 1935 he gave £60,000 to New Zealand, and soon after £50,000 to Australia, toward the discovery and treatment of children crippled or attacked by some crippling disability. For a long time Lord Nuffield has been anxious to help forward this work in Great Britain, in order that in every area adequate provision may be made for the early and efficient orthopædic treatment of every child, adolescent, or adult in need of it. And now, as recorded in your last issue, he has given the sum of £125,000 for this purpose. The major part of this sum will be allocated to a Lord Nuffield Central Fund which is to be applied at the discretion of the trustees during the next four or five years to develop the discovery, cure, and care of cripples in the various districts where this work is not being at present specifically undertaken, or is being undertaken on an entirely inadequate scale. Much credit is due to the Central Council for the Care of Cripples that many parts of the country are already well organised. But there are districts where a great deal remains to be done; their requirements will be explored and recommendations made to the trustees of the Fund for grants in aid of new work.

Lord Nuffield is devoting another part of his benefaction to the endowment of a scholarship in orthopædic surgery; this is to be tenable for two years at the Wingfield-Morris Orthopædic Hospital, Headington, Oxford, with a travel period of three months to follow. He hopes this will attract and be of value to young surgeons who are specialising in orthopædic surgery. It will provide an opportunity of working in an orthopædic hospital of the most modern design, and with a well-established outside organisation for the early discovery of potential cripples, their out-patient treatment, and their after-care. It is proposed that the regius professor of medicine of Oxford and the president of the British Orthopædic Association shall be on the small electoral body for this scholarship.

I am, Sir, yours faithfully,

Oxford, Dec. 27th, 1935. G. R. GIRDLESTONE.

NARCO-ANALYSIS

To the Editor of THE LANCET

SIR,—Recent allusions in the newspapers to the use in America of "truth serum" ignore the fact that certain drugs facilitate not only the divulgence of carefully guarded secrets but also the restoration of forgotten memories. Such possibilities are of interest not only to the criminologist but also to the psychiatrist. The successful combination of narcosis with psychotherapy would be a real advance in mental treatment. Many writers have referred to the value of such a combination, but so far as I know the

narcopsychological approach has not progressed beyond the method of simple suggestion. This is due to the stupefying effect of the narcotics employed.

In an attempt to extend this line of investigation, I have experimented with Somnifaine, Sodium amytal, Sodium soneryl, Nembutal, and a combination of Evipan with Avertin. I find nembutal the most effective in producing sedation with the minimum of confusion. I have evolved a technique which I call "narco-analysis."

The usual routine examination is made and the patient is then prepared as for a general anæsthetic. A state of light narcosis is produced by the slow intravenous injection of a 2½ per cent. solution of nembutal. During the injection every effort is made to make the patient amenable to hypnotic analysis. The resulting willingness of the patient, the release of inhibitions, and the ability to recall experience, recent or remote, makes analysis relatively simple and speedy. In an hour the physician obtains a quantity of relevant information which he would not have obtained in a month by ordinary methods. A true hypnotic state is induced, and this facilitates suggestion, which must be given with great care and forethought. It is directed in all cases towards restoring the contact of the patient with the realities of his life and environment.

The séance is prolonged for about half an hour and then merged into deep narcosis by a further injection of nembutal. The same technique can be repeated if necessary on successive days. The following is a typical case :—

A single woman, aged 37, was brought to hospital for temporary treatment under Section 5 of the Mental Treatment Act, 1930. The recommendations stated that for six weeks she had been abnormally depressed, deluded as to her identity, and grossly disorientated. A week after admission her condition was unchanged. Narco-analysis was begun on the eighth day. She at once became calm and coöperative, and recalled significant forgotten memories which were of value in re-establishing environmental contact. Two séances secured a total of 50 hours' sleep. On waking she described a dream symbolising her recovery. From this moment she remained bright, cheerful, and amenable. A fortnight later she was discharged recovered.

This case is illustrative of some 130 treated by the same method. The results have been encouraging in all of them, and I hope in due course to report the results in detail. I am indebted to Dr. P. W. Bedford, medical superintendent of this hospital, for permission to publish the above case.

I am, Sir, yours faithfully,

J. STEPHEN HORSLEY,
Senior Assistant Medical Officer,
Dorset Mental Hospital.

Dec. 10th, 1935.

PLEURAL SHOCK AND/OR AIR EMBOLISM

To the Editor of THE LANCET

SIR,—Whilst agreeing with the conclusion reached in the editorial article in THE LANCET of Dec. 28th—namely, that this accident of artificial pneumothorax may well be avoided altogether by careful technique—I do not think the methods suggested are necessary or even wise, nor do I think the usual mechanism of air embolism can be that which you describe. As this complication occurs more frequently during refills than during inductions, it does not seem very likely that it is caused by puncture of the lung or of an adhesion, both of which must take place much more frequently during the first attempted injection than later. Even from a mechanical point of view this seems an unlikely accident. Most apparatus is reasonably airtight, and the volume of air contained in the accessory tubing must be a good deal less than 75 c.cm., but let us suppose for the sake of argument that this large volume of air is contained in the tubing, and let us further suppose that the suction in the vein entered is equal to a pressure of 13 cm. of water or 1 cm. of mercury. It is of course most unlikely to be so high, as experience of manometer readings shows that records of this order are never obtained except when the point of the needle is in the pleural cavity. Experience also shows that there is considerable resistance even in a fairly wide bore needle, which damps manometer fluctuations and obstructs the rapid flow of air, but let us ignore this resistance. The volume of the air therefore in the tubing will expand under the reduced pressure, and a volume $75 \times \frac{76}{75} - 75 = 1$ c.cm. of air will be free to enter the vein. Is it possible for so small a quantity of air, after being churned up and partly absorbed by the blood in the heart and great vessels, to cause serious symptoms? We have considered an extreme possibility; in ordinary circumstances the volume which could in this way enter the vein would be far less, and moreover would enter slowly owing to friction in the needle. I cannot believe that this is the mechanism of air embolism, provided of course that air from the storage compartment is not allowed to flow through the needle before assurance is made that the point is in the pleural cavity.

On the other hand, during either inductions or refills adhesions may be torn by the retracting lung. These are, moreover, more likely to contain lung tissue when lacerated by the powerful retraction of an already partly collapsed lung, that is during refills, than when severed by the comparatively feeble pull of the almost fully expanded lung, that is during inductions. Spontaneous pneumothorax complicating artificial pneumothorax and due to laceration of an adhesion is not an infrequent happening. It is, therefore, easy to conceive of air embolism being caused by a tearing of an adhesion containing a branch of the vein, and thus allowing air from the pleural cavity to enter the circulation freely, in just the same way that air may flow from the air passages into the pleural cavity, should the adhesions contain portions of the lung in communication therewith.

The prevention of air embolism is therefore, I hold, the adoption of a technique which does not produce extreme tension in any adhesion, unless this is felt to be desirable after a careful consideration of all aspects and of all dangers, and then taking care to ensure that this tension is not suddenly applied.

I am, Sir, yours faithfully,

C. O. S. BLYTH BROOKE,
Tuberculosis Officer, Borough of Finsbury.

Dec. 23rd, 1935.

ATEBRIN POISONING

To the Editor of THE LANCET

SIR,—I read with interest the report by Drs. Fernando and Wijerama of a fatal case of Atebrin poisoning, published in your issue of Nov. 9th. The following case, admitted to the Mysore Government Mental Hospital, Bangalore, presented neurological and psychiatric symptoms, following the administration of atebrin, which may be worthy of notice :—

The patient, a flabby male aged 32, was referred on Nov. 19th, 1935, by his medical attendant for protective

observation because he showed acute maniacal symptoms. He had been having daily attacks of malaria for the past three weeks, and quinine administered during the first week had given no relief. During the eight days before admission he had two pills of atebrin daily, and three injections of atebrin mussonate. Fever had subsided, but 24 hours before admission he had become destructive and violent.

Physical Examination.—The patient was very restless, throwing about bed-clothes, and had to be restrained. He was deeply jaundiced. The liver and spleen were not palpable, and there was no evidence of hepatic pain; the tongue was thickly coated and the breath foul. The pulse-rate was rapid, 120 per minute, of low tension, irregular, missing one in every 10–12 beats. The apex-beat was within the nipple line, but a soft unconducted, systolic murmur replaced the first sound in the apical and pulmonary areas. The pupils were moderately dilated and reactive, but there were coarse, rapid, nystagmoid jerks, about 16 per minute, making it almost impossible for the patient to fixate. He had fine tremors of the tongue and hands. Speech was slow and hesitating, but there was no dysphasia. The reflexes were sluggish except the knee-jerk, which was ++++. No Babinski sign.

Mental Examination.—Restless; psychomotor activity increased of both the small and large joints; disorientated with reference to time and space; he would shout that snakes and fantastic animals were crawling on the floor, and reacted to such visual hallucinations with fear, violence, and emotional instability.

Laboratory Findings.—No malarial parasites found. Urine scanty, reaction acid, no sugar or albumen found; no bile pigments or atebrin were present. Faeces foul-smelling, but yellow and not clay-coloured.

Progress and Treatment.—The patient was given immediately a magnesium sulphate enema, and on account of his restless and non-coöperative state, a paraldehyde enema. He passed a quieter night. He was put on daily injections of cyclotropin (five days) and strychnine gr. 1/20 b.d., and general treatment like daily warm sponging. His mental symptoms cleared up within three days and his jaundice on the seventh day. On Nov. 29th, 11 days after admission, he was discharged recovered, though somewhat weak.

The case is of interest as showing mental symptoms suggestive of delirium tremens (the patient was a total abstainer) and neurological symptoms suggestive of an involvement of the labyrinthine cerebellar extrapyramidal pathways. I have seen several cases of santonin poisoning with similar symptoms.

I am, Sir, yours faithfully,

M. V. GOVINDASWAMY,
Superintendent, Mental Hospital, Bangalore.

Dec. 12th, 1935.

PUBLIC HEALTH

The Two-Shift System

THE two-shift system of employment was legalised in 1920, but the trade depression has discouraged many employers from introducing it. Two shifts of eight hours each are worked between 6 A.M. and 10 P.M., so that machinery can be kept running for 88 hours a week, though no worker is employed for more than 48 hours. A report issued in 1928[1] contrasted the output, lost time, and labour turnover of the same workers employed on either system. The hourly output of the shift workers was greater, the voluntary rest pauses fewer, although, as the working hours were shorter, the output per worker was 4 per cent. less than in the ordinary system. An employer who changed from day-work with a 48-hour working week to shift-work of 82 hours might expect an increase of output per machine of over 92 per cent. There was no definite advantage in either system with regard to the sickness experienced by the workers.

At the present time 36,000 women and young persons are working in double shifts. The system has been very carefully examined by a departmental committee, particular attention being paid to the health and the social and home life of the workers. The single disadvantage, about which there has been no general complaint, is the relative lateness of certain of the meal-times. In the morning shift, for example, the midday meal cannot be taken until 2 P.M. The advantages are the shorter hours, the greater leisure during the day, and the increased opportunities of fresh air and exercise. These led the committee to the conclusion that the system did not in any way injure the health of the workers.

Moving the second reading of the Employment of Women and Young Persons Bill in the House of Commons on Dec. 17th, Mr. Geoffrey Lloyd, Under-Secretary of the Home Office, said that the Bill was to continue this scheme with certain modifications and safeguards. The rejection of the Bill was moved by Mr. Rhys Davies because of the increasing liability of young persons to accidents at their work, due to the greater speed of working. He objected to the double-shift system on this ground and because it was contrary to the social habits of the British people. The medical aspects of the system were discussed by Dr. Howitt, who had served as an adviser on the committee. He assured the House that the system could have no adverse effect upon the health of the workers. This was the opinion of the great majority of the doctors, welfare workers, factory inspectors, and supervisors, and also of the workers themselves, not only in evidence before the committee, but also in answer to inquiries conducted in the factories. The chief medical inspector had assured them that he had not had a single complaint from any worker on a double shift about the system. The scheme eliminated the long periods of overtime which were particularly bad for women and young persons. Another advantage was the greater supervision and the higher standard of amenities which the Home Secretary demanded before he would grant an order. The workers appreciated the break in the monotony of factory work given by the shorter hours and particularly the alternate free week-ends. Mr. Hollins (Lab., Stoke-on-Trent) however was able to cite some evidence that double-shift workers suffered more than day workers from headache and respiratory diseases. After the Home Secretary had given an undertaking that the Government would appoint an advisory committee, the second reading of the Bill was carried.

[1] The Two-Shift System in Certain Factories. By Mary Smith and M. D. Vernon. Industrial Fatigue Research Board. Report No. 47. H.M. Stationery Office. 1928. See THE LANCET, 1928, i., 740.

HUDDERSFIELD MUNICIPAL HOSPITAL.—Huddersfield health committee are proposing to build a new municipal hospital in the town which, it is estimated, will cost about £100,000.

LEITH HOSPITAL.—The managers of this hospital have issued an appeal for £60,000 for the reconstruction of its buildings. The existing medical block is to be demolished and a five-storey block erected which will contain male and female medical wards and administrative and sun-ray departments.

MEDICAL NEWS

University of Cambridge

At recent examinations the following candidates were successful :—

THIRD EXAMINATION FOR M.B. AND B.CHIR.

Part I., Surgery, Midwifery, and Gynæcology.—L. J. Bacon, R. G. Bickford, R. A. Binning, G. L. Broderick, S. C. Buck, W. A. Burnett, R. S. Castle, E. M. Darmady, R. B. Davis, J. Diver, F. S. A. Doran, E. W. Dorrell, R. C. Droop, C. H. C. Ferguson, T. D. Fraser, I. N. Fulton, B. S. C. Gaster, M. H. Harding, E. W. Hart, F. E. S. Hatfield, C. M. Heath, A. L. Jackson, D. D. Keall, R. G. M. Keeling, J. W. Landells, D. C. Lavender, A. B. Lintott, L. N. G. Lytton, J. MacKellar, F. C. Maddox, D. N. Matthews, H. K. Meller, J. S. Minett, T. J. Morton, B. C. M. Palmer, J. W. Parks, W. J. E. Phillips, G. C. L. Pile, J. M. Ranking, G. R. Rawlings, G. Rigby-Jones, O. N. Roussel, H. P. Ruffell Smith, R. S. Saxton, D. R. Seaton, R. H. A. Swain, W. H. Valentine, J. H. Ward, S. Ward, D. J. Watterson, A. S. Wigfield, J. R. C. Williams, H. T. H. Wilson, J. R. J. Winter, H. R. Wynne, B. J. Travers, E. H. Western, E. L. Willis, and E. M. Wright.

Part II., Principles and Practice of Physic, Pathology, and Pharmacology.—L. J. Bacon, W. M. Beattie, N. B. Betts, K. O. Black, A. C. Blandy, R. E. Bonham-Carter, F. Braithwaite, G. L. Broderick, A. F. Bryson, W. T. Cooke, E. M. Darmady, D. H. Davies, H. S. Davis, C. A. Dowding, R. D. Ewing, C. U. Gregson, G. N. St J. Hallett, J. W. Hannay, C. Hardwick, J. R. G. Harris, A. E. M. Hartley, N. T. Holden, C. S. Humphries, H. D. Johnson, J. R. Kerr, J. W. Lacey, D. C. Lavender, J. F. Lown, K. G. F. Mackenzie, I. W. MacKichan, D. N. Matthews, S. G. Mayer, R. S. Morris, J. R. Owen, R. J. Porter, C. N. Pulvertaft, C. G. Rob, A. G. Salaman, D. S. Scott, P. G. Scott, J. A. Seymour-Jones, A. F. Stallard, F. Stansfield, W. H. Valentine, H. J. Wallace, B. L. Williams, J. R. J. Winter, M. Ball, S. L. Bhatia, E. L. Willis, and W. F. Young.

University of London

At recent examinations the following candidates were successful :—

M.S.

Branch I. (Surgery).—T. W. Mimpriss, St. Thomas's Hosp.

Branch III. (Ophthalmology).—Jean M. Dollar, Royal Free Hosp.

Branch IV. (Laryngology, Otology, and Rhinology).—W. H. Bradbeer, Guy's Hosp.

DIPLOMAS IN CLINICAL PATHOLOGY

D. H. Haler, King's Coll. Hosp. (external diploma); and A. A. Razzak, Middlesex Hosp. (academic post-graduate diploma).

University of Durham

On Dec. 21st at the College of Medicine, Newcastle, the following degrees and diplomas were conferred :—

M.B., B.S.—K. G. Scott Bavidge, F. W. Boon, M. J. Bruno, A. W. Chester, H. P. Clark, Dorothy M. Clarkson, J. Dagg, C. W. Elphick, W. A. S. Falla, S. Hurwitz, G. B. Jamieson, Jean D. McKellar, B. de F. Pieris a Rosenbloom, T. A. Shaw, and M. Taws.

B.Hy.—Edna T. Everdell, Dorothy D. Nichol, and Eleanor Patterson.

D.P.H.—E. G. Brewis, Edna T. Everdell, Dorothy D. Nichol, Eleanor Patterson, and Agnes A. Schofield Russell.

L.D.S.—F. N. Hutchinson Gargett, E. M. Pickering, and W. Robson.

University of Edinburgh

On Dec. 20th the following degrees and diploma were conferred :—

M.D.—John Bennet, B. S. Bindra (in absentia), ‡John Douglas, E. H. Duff, †H. J. Gibson, ‡Israel Gordon (in absentia), ‡J. B. Martin (in absentia), H. S. E. Murray, ‡D. C. Osborne, ‡T. M. J. Stewart, J. L. Swanston, *Mary B. Walker, and John White (in absentia).

M.Ch.—†Ian Aird.

* Awarded gold medal for thesis. †Highly commended for thesis. ‡ Commended for thesis.

M.B., Ch.B.—A. F. H. Aeria, C. H. Bannerman, E. W. Q. Bannerman, E. G. Barnes, W. M. Burgess, A. P. Burnett, R. J. C. Campbell, T. M. S. Clark, A. H. Crichton, Winifred M. Dempster, Harold Ferguson, W. G. S. Harden, H. O. Howat, R. P. Jack, J. M. M. Jamieson, P. M. Kirkwood, R. K. M'All, T. A. MacGibbon, A. I. M'Kendrick, D. S. M'Kenzie, Duncan MacKenzie, K. I. E. Macleod, A. B. Milligan, T. R. N. Parhar, R. G. Parker, Isabella A. Purdie, A. S. L. Rae, A. N. Reid, R. J. S. Smith, Robert Somerville, Alfred Stern, H. H. Stott, and G. L. Walker.

D.P.H.—T. A. Don.

Dr. Mary Walker was awarded the gold medal for her thesis on myasthenia gravis, which incorporated her discovery of the action of physostigmine and prostigmin in its treatment.

Society of Apothecaries of London

At recent examinations the following candidates were successful :—

Surgery.—W. C. Heunis, Lond. Hosp.; J. M. Lea, Guy's Hosp.; and N. O. Lucas, Univ. of Oxford and Guy's Hosp.

Medicine.—C. W. Mills, St. Bart.'s Hosp.; J. F. O'Malley, Guy's Hosp.; and G. M. Williams, London Hosp.

Forensic Medicine.—C. W. Mills, St. Bart.'s Hosp.; and J. F. O'Malley, Guy's Hosp.

Midwifery.—G. K. Coombes, King's Coll. Hosp.; B. Anderson, Charing Cross Hosp.; and H. Bentovim, Univ. of Manch.

The following candidates, having completed the final examination, are granted the diploma of the society entitling them to practise medicine, surgery, and midwifery : B. Anderson, N. O. Lucas, and G. M. Williams.

Queen's University, Belfast

On Dec. 21st the following degrees were conferred :—

M.D.—J. C. C. Crawford, J. V. Hurford, and T. W. H. Weir (with commendation); and E. A. J. Byrne (in absentia).

M.B., B.Ch., B.A.O.—J. E. Morison (second class honours); F. C. Banks, J. P. Cosgrove, W. W. Davey, W. McKeown, C. C. D. Martin, B. V. Megarry, W. D. Miles, N. J. Y. Simpson, Louise Skillen, and W. McL. E. Topping.

L.D.S.—I. St. C. Alderdice and S. Hill.

University of St. Andrews

At a meeting of the court on Dec. 26th Mr. R. C. Alexander was appointed professor of surgery and Mr. R. S. Melville lecturer in clinical surgery.

Mr. Alexander was educated at the University of Edinburgh where he graduated in arts, and in 1908 obtained the degree of M.B. with honours. After further study in Paris he returned to Edinburgh, where he became a fellow of the Royal College of Surgeons in 1911, and was appointed assistant surgeon to the Chalmers Hospital. In 1921 he went to Dundee where he became surgeon to the Royal Infirmary and lecturer in clinical surgery at the University of St. Andrews. During the war he served with the British Expeditionary Force, holding rank as major in the R.A.M.C. He is a contributor to the Encyclopædia of Medicine, and has written on the surgery of many different conditions, including cysts of the liver, adenoma of the bile-ducts, and anuria. He is an examiner in operative surgery and surgical pathology for the Royal College of Surgeons of Edinburgh, and consulting surgeon to the Memorial Cottage Hospital, St. Andrews, and the County and City of Perth Royal Infirmary.

Regulation of Warfare

An international committee of the Congress of Military Medicine and Pharmacy has for some time been considering the regulation of warfare, and a conference to discuss the subject will meet at Monaco from Feb. 10th to 12th. Prof. Dehousse, of Liége, will describe the present state of the law towards war, especially as regards the protection of the civilian population, and Dr. Voncken, director of the Office International de Documentation de Médecine Militaire, will discuss ambulance services in the war of the future. The third purpose of the meeting will be the establishment of an Association Universelle pour la Protection Internationale de l'Humanité. Further information may be had from Dr. Voncken, Quai de Plaisance, Monaco.

Conference on Mental Health

The National Council for Mental Hygiene is holding its fourth biennial conference on mental health at the Central Hall, Westminster, from Jan. 23rd to 25th. The Duke of Kent, president of the council, will open the conference and will take the chair at the first session when Lord Allen of Hurtwood and Dr. William Brown will discuss mental hygiene and international relations. Other subjects and speakers which have been announced are : the organisation and correlation of mental health services in local areas (Prof. R. M. F. Picken and Dr. T. Saxty Good); problems of marriage and the establishment of courts of domestic relations (Dr. Helen Boyle); and the priest and the doctor in the treatment of nervous and mental disorders (Dr. H. Crichton-Miller). There will be a symposium on education for living, comprising mental health, those first eight years (Dr. R. G. Gordon, Dr. Maria Montessori); "moulding" the mind, eight to fourteen (Dr. Emanuel Miller); and the "finished" product, fourteen onwards. The secretary of the council may be addressed at 78, Chandos House, Palmer-street, London, S.W.1.

Royal Institution of Great Britain

On Jan. 31st the Friday evening discourse will be given at 9 P.M. by Prof. Edward Mellanby, F.R.S., who will speak on recent advances in the treatment of disease. On March 10th, 17th, 24th, and 31st, at 5.15 P.M., he will give a series of lectures on drug-like actions of some foods. The address of the institution is 21, Albemarle-street, London, W.1.

Lectures on Industrial Law

The Industrial Welfare Society is arranging a course of lectures which will give those interested in administrative work in industry and commerce a practical knowledge of the branches of the law which they will need. The lectures will be given by Mr. H. Samuels on Wednesdays from Jan. 22nd at the headquarters of the society, 14, Hobart-place, Westminster, S.W., at 6.30 P.M.

British Ambulance Unit in Abyssinia

This unit, which was originally planned for work in the Ogaden, has, at the express wish of the Emperor, now gone to Dessie. It thus becomes the chief Red Cross unit for the northern armies in Abyssinia. This change has incurred heavy additional expenditure. Donations may be sent to Sir Arthur Stanley, British Red Cross Society, 14, Grosvenor-crescent, London, S.W.1, or to the hon. treasurer of the British Ambulance Service in Ethiopia (Mr. A. W. Tuke), Barclays Bank, 54, Lombard-street, E.C.2.

Fellowship of Medicine and Post-Graduate Medical Association

The following all-day courses will be available during the first two months of this year: cardiology at the National Hospital for Diseases of the Heart (Jan. 13th to 24th); proctology at St. Mark's Hospital (Feb. 3rd to 8th); gynæcology at the Chelsea Hospital for Women (Feb. 10th to 22nd). Week-end courses will be held in heart and lung diseases at the Royal Chest Hospital (Jan. 18th and 19th); in physical medicine at the St. John Clinic and Institute of Physical Medicine (Feb. 8th and 9th); in children's diseases, Princess Elizabeth of York Hospital (Feb. 22nd and 23rd). On Tuesdays and Thursdays at 8.30 P.M., from Jan. 14th to March 5th, surgical tutorial classes (specially suitable for F.R.C.S. candidates) will be given at the National Temperance Hospital, and an evening course in anatomy and physiology (in preparation for the primary F.R.C.S. examination) from Feb. 24th to April 24th, at the Infants Hospital, Vincent-square, S.W. Further information may be had from the secretary of the Fellowship at 1, Wimpole-street, W.1.

Appointments

LANGLEY, G. F., Ch.M. Brist., F.R.C.S. Eng., has been appointed Senior Resident Medical Officer at the East Suffolk and Ipswich Hospital.

MACIVER, DONALD, M.D. Edin., D.P.H., Medical Officer of Health to Walton and Weybridge Urban, and Bagshot Rural, Councils.

Hospital for Epilepsy and Paralysis, Maida Vale.—The following appointments are announced:—

ELKINGTON, J. ST. CLAIR, M.D. Camb., F.R.C.P. Lond., Second Honorary Assistant Physician;

NEVIN, S., M.D. Belf., M.R.C.P. Lond., Third Honorary Assistant Physician; and

MCKISSOCK, WYLIE, M.S. Lond., F.R.C.S. Eng., Honorary Assistant Surgeon.

London County Council Hospital Staff.—The following appointments and transfers are announced: A.M.O. (II.) = Assistant Medical Officer, Grade II.:—

DONALD, A. B., M.B. Aberd., A.M.O. (II.), North Western;
LEWIS, J. T. R., M.B., D.P.H., A.M.O. (II.), South Western;
PICTON, W. H. A., B.M. Oxon., A.M.O. (II.), Park;
CAMPBELL, R. M., M.B. Aberd., A.M.O. (II.), Grove;
JAMES, M. F., M.B., A.M.O. (II.), Brook;
GIBSON, M. O., M.B. Glasg., D.P.H., A.M.O. (II.), North Western;
CARDWELL, E., L.R.C.P. Edin., A.M.O. (II.), Southern;
LIDDELL, V. L., M.B., A.M.O. (II.), Western;
BATEMAN, L. L., M.B., A.M.O. (II.), Northern; and
WILSON, E. M. R., M.B., A.M.O. (II.), South Western.

Vacancies

For further information refer to the advertisement columns

Birmingham City Mental Hospital.—Jun. Asst. M.O. £350.
Birmingham and Midland Eye Hospital.—Res. Surg. O. £200.
Birmingham, Selly Oak Hospital.—Jun. M.O.'s. Each at rate of £200.
Birmingham, St. Chad's Hospital.—Jun. Res. M.O. At rate of £150.
Birmingham United Hospital.—Bacteriologist and Clin. Pathologist. £500.
Bolingbroke Hospital, Wandsworth Common, S.W.—H.P. At rate of £120.
Charing Cross Hospital, W.C.—Hon. Anæsthetist.
Chichester, Royal West Sussex Hospital.—Jun. H.S. At rate of £125.
Connaught Hospital, Walthamstow, E.—Cas. O. £100.
Coventry and Warwickshire Hospital.—H.S. to Aural and Ophth. Depts. At rate of £125.
Croydon Mental Hospital, Upper Warlingham.—Asst. M.O. £350.
Doncaster Royal Infirmary.—H.S. £175.
Eastbourne, Royal Eye Hospital, Pevensey-road.—H.S. £100.
Glasgow Royal Mental Hospital, Gartravel.—Asst. Physician. £300.
Halifax Hospital for Infectious Diseases.—Res. M.O. £350.
Hampshire County Council.—Asst. County M.O.H., &c. £800.
Hove General Hospital.—Hon. Physio-therapeutist.
Huddersfield County Borough.—Asst. School M.O. £500.
Hull Royal Infirmary.—Cas. O. At rate of £150.
Ilford Council Maternity Home.—Res. M.O. £350.
Institute of Ray Therapy and Electrotherapy, 152, Camden-road, N.W.—Part-time M.O. At rate of £100.
Isleworth, West Middlesex County Hospital.—Res. Anæsthetist. £400. Also Cas. M.O. £350.
Kettering and District General Hospital.—Second Res. M.O. At rate of £125.
Leeds General Infirmary.—Res. Aural Officer. £149.
Liverpool, David Lewis Northern Hospital.—Cas. O. At rate of £120. Also four H.S.'s and two H.P.'s. Each at rate of £80.
Liverpool, Mill-road Infirmary.—Res. Deputy Med. Supt. £450.
Liverpool, Royal Children's Hospital.—Two Res. Phy.'s and two Res. Surg.'s, for City Branch, Myrtle-street. Also Res. M.O. and Res. Surg. O. for Heswall Branch.
Liverpool Royal Infirmary.—Sen. Cas. O. At rate of £120. Also Jun. Cas. O. and H.S. to Skin Dept. At rate of £60.
London Hospital, E.—Med. 1st Asst. and Reg. £300. Also Asst. in X Ray Dept. £100.
London Jewish Hospital, Stepney Green, E.—Out-patient Asst. £125.
London Skin Hospital, Fitzroy-square, W.—Hon. Asst. Physician.
London University.—Readership in Surgery. £800–£1000.
Manchester, Ancoats Hospital.—Res. Surg. O. £200.
Manchester, Booth Hall Hospital for Children.—Res. Jun. Asst. M.O. £200.
Manchester Royal Infirmary.—Four H.S.'s, H.S. to Aural, Gyn., and Ophth. Depts., H.S. to Neurosurgical Dept., H.S. to Orthopædic Dept. Also four H.P.'s. All at rate of £50.
Metropolitan Hospital, Kingsland-road, E.—Res. Cas. O. £100.
Newcastle General Hospital.—Two H.S.'s and two H.P.'s. Each at rate of £150.
Newcastle-upon-Tyne, Barrasford Sanatorium.—Res. Med. Asst. £250.
Newcastle-upon-Tyne, Hospital for Sick Children.—Res. Surg. O. £250. Also H.P. and H.S. Each at rate of £100.
Nottingham General Hospital.—H.S. At rate of £150.
Princess Louise Kensington Hospital for Children, St. Quintin-avenue, W.—Clin. Asst.
Putney Hospital, Lower Common, S.W.—Jun. M.O. At rate of £100.
Queen's Hospital for Children, Hackney-road, E.—Three Anæsthetists. One guinea per attendance.
Rochdale Infirmary and Dispensary.—Sen. H.S. £250.
Royal Masonic Hospital, Ravenscourt Park, W.—Surgeon.
St. Bartholomew's Hospital, E.C.—Asst. Physician. Also Asst. Physician and Asst. Director to Medical Professorial Clinic.
St. Mary's Hospital, W.—Cas. H.S. At rate of £100.
South London Hospital for Women, Clapham Common, S.W.—Out-patient M.O. £100.
Stirling District Mental Hospital, Larbert.—Third Asst. M.O. £250.
Stoke-on-Trent, Longton Hospital.—H.S. £160.
Swansea General and Eye Hospital.—Cas. O. At rate of £150–£175. Also H.P. and H.S. Each at rate of £150.
Victoria Hospital for Children, Tite-street, Chelsea, S.W.—Cas. O. At rate of £200. Also H.P. and H.S. Each at rate of £100.
Walsall General Hospital.—H.S. At rate of £150.
Warrington County Borough.—Asst. M.O.H. £450.
Warrington, County Mental Hospital, Winwick.—Asst. M.O. £500.
West End Hospital for Nervous Diseases, Gloucester-gate, N.W.—Res. H.P. £125.
West End Hospital for Nervous Diseases, Welbeck-street, W.—Hon. Clin. Asst. to Out-patient Clinic.
Willesden Borough.—Anæsthetist. Also Throat, Nose, and Ear Surgeon. Each £2 12s. 6d. per session.
Worksop, Victoria Hospital.—Sen. and Jun. Resident. At rate of £150 and £120 respectively.

The Chief Inspector of Factories announces vacancies for Certifying Factory Surgeons at Mochrum (Wigtown), Stanley (Perth), and Cheltenham (Gloucester).

NEW YEAR HONOURS

THE list of honours issued on Wednesday contains the names of the following members of the medical profession :—

K.C.V.O.

Louis Francis Roebuck Knuthsen, C.V.O., O.B.E., M.D.
Physician-in-ordinary to the Princess Royal; consulting physician to the London Skin Hospital.

Knights Bachelor

Colonel Charles Isherwood Brierley, C.I.E., M.R.C.S., I.M.S. (retd.)
Lately inspector-general of civil hospitals and jails, North-West Frontier Province.

Hugh Berchmans Devine, M.S.
Vice-president of the Royal Australasian College of Surgeons.

Mangaldas Vijbhucandas Mehta, O.B.E., F.R.C.P.I.
Medical practitioner, Bombay.

David Percival Dalbreck Wilkie, O.B.E., F.R.C.S.
Professor of surgery in the University of Edinburgh.

C.B. (Military)

Major-General F. G. FitzGerald, D.S.O., L.R.C.P.I.
Deputy director of medical services, Eastern Command.

C.M.G.

Rupert Briercliffe, O.B.E., M.R.C.P.
Director of medical services, Ceylon.

Colonel Arthur Murray Cudmore, F.R.C.S.
Surgeon to Adelaide Hospital; consulting surgeon of the Australian Army Medical Corps Reserve.

C.I.E.

Major R. S. Aspinall, F.R.C.S.E., I.M.S.
Civil surgeon, Ajmer-Merwara and chief medical officer, Rajputana.

James Cairns, O.B.E., M.D.
Chief medical officer, North-Western Railway, Punjab.

Lieut.-Colonel W. R. Stewart, F.R.C.S.E., I.M.S.
Surgeon to the Viceroy of India.

C.V.O.

William Gilliatt, F.R.C.S.
Obstetrical and gynæcological surgeon to King's College Hospital, London.

Howell Gwynne-Jones, M.R.C.S.
(Dated Dec. 12th, 1935).

C.B.E.

Lieut.-Colonel A. M. Dick, O.B.E., F.R.C.S., I.M.S.
Professor of ophthalmology in the King Edward Medical College, Lahore.

O.B.E. (Military)

Surgeon-Commander F. G. Hitch, M.B., R.N.

O.B.E. (Civil)

William Kenneth Bigger, M.C., M.R.C.S.
Senior medical officer, Palestine.

Cyril Charles Herbert Cuff, F.R.C.S.E.
Surgical specialist, Cyprus.

Robert William Dodgson, M.R.C.P.
Director of shellfish services, Ministry of Agriculture.

John Griffiths, M.R.C.S., D.P.H.
Medical officer of the Neath rural district council.

John Hutson, M.B.E., M.B.
Of Barbados.

Robert Jamison, F.R.C.S.
Principal medical officer, Swaziland.

William Brownlow Ashe Moore, L.R.C.P.I.
Deputy director of medical services, Hong-Kong.

Mrs. Mary Josephine Were, L.R.C.P.I.
Lady medical officer, Federated Malay States.

M.B.E.

Robert McLean Gibson, F.R.C.S.E.
Of Hong-Kong.

Rai Sahib Achhru Ram.
Civil surgeon, Uganda.

Kaikhusro Sorabji Sethna, L.M. and S.
Health officer of the Delhi municipality.

Miss Janet Welch, M.B.
Medical officer, Church of Scotland Mission Hospital, Blantyre, Nyasaland.

Hon. M.B.E.

Fuad Dajani, M.R.C.S.

Kaisar-i-Hind Medal

Ramkrishna Narayan Parmanand, L.M. and S.
Chief medical officer, Adams Wylie Memorial Hospital, Bombay.

Births, Marriages, and Deaths

BIRTHS

ABDULLAH.—On Dec. 7th, the wife of Dr. A. D. Abdullah, of a son.

FISHER.—On Dec. 24th, at Abingdon, Berks, the wife of Dr. John Fisher, of a son.

KIDD.—On Dec. 27th, the wife of H. A. Kidd, F.R.C.S. Edin., of a daughter.

MULHOLLAND.—On Dec. 22nd, at Whimple, Devon, the wife of H. H. Mulholland, M.B. Belf., of a daughter.

PARKINSON.—On Dec. 24th, the wife of Ellis Parkinson, M.B. Birm., of Wyke Regis, Weymouth, of a son.

STARKIE.—On Dec. 24th, at Devonshire-place, W., the wife of E. T. W. Starkie, M.A., B.Chir., of Creaton Sanatorium, Northants, of a daughter.

MARRIAGES

GREENWAY—STRIDE.—On Dec. 21st, at Eastergate Parish Church, Dr. Geoffrey Hudson Greenway to Peggy, younger daughter of the late Mr. F. Stride of Barnham, Sussex.

DEATHS

ALLEN.—On Dec. 28th, at Oulton Heath, Stone, Maria Shepherd Allen, L.R.C.P. Edin., aged 58.

ARUNDEL.—On Dec. 28th, at Wrecclesham, Farnham, Robert James Arundel, M.D. Dub., Capt., R.A.M.C., retd.

BALLARD.—On Dec. 23rd, at Shepherdswell, Dover, Philip Ballard, M.R.C.S. Eng., late of Smarden, Kent, in his 81st year.

COTTON.—On Dec. 23rd, at Sheffield, Robert Hugh Cotton, M.R.C.S. Eng., in his 55th year.

DANIEL.—On Dec. 25th, at Ealing, Robert Napier Daniel, M.R.C.S. Eng., aged 69.

GILES.—On Dec. 26th, at Welwyn, Herts, Arthur E. Giles, M.D. Lond., F.R.C.S. Edin., aged 71.

GORDON-WATSON.—On Dec. 21st, 1935, Alice Geraldine Mary, dearly loved wife of Sir Charles Gordon-Watson, of 82, Harley-street, W.1, after a long and painful illness, most bravely borne.

HEWETT.—On Dec. 27th, at The Wilderness, Hampton Hill, Lieut.-Col. Augustus Hewett, F.R.C.S. Edin. (late R.A.M.C.), aged 82.

HOWELL.—On Dec. 21st, at Middlesbrough, Robert Edward Howell, M.B. Edin., aged 70.

MATTHEWS.—On Dec. 28th, at a Brighton nursing-home, Gladys Matthews, M.R.C.S. Eng., late of the C.M.S., Punjab, India.

PERCIVAL.—On Dec. 22nd, at Shenley, Woking, Archibald Stanley Percival, M.A. Durh., M.A., M.B. Camb.

SINCLAIR.—On Dec. 23rd, at 25, Elvaston-place, S.W.7, James Edward Sinclair, L.R.C.P. Edin., formerly of Queen Anne's-gate, and Wyndham House, Aldeburgh.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

ROYAL SANITARY INSTITUTE.—Recent developments in sewage treatment and disposal at the London County Council works will be the subject of a paper to be read by Mr. J. H. Coste, the chief chemist of the Council, at a sessional meeting of this institute (90, Buckingham Palace-road, London, S.W.), to be held on Tuesday, Jan. 14th, at 5.30 P.M.

NOTES, COMMENTS, AND ABSTRACTS

PUBLIC HEALTH IN INDIA*

RETROSPECT AND PROSPECT

By Major-General Sir JOHN MEGAW, K.C.I.E., D.Sc., M.B. R.U.I.

MEDICAL ADVISER TO THE SECRETARY OF STATE FOR INDIA; LATE DIRECTOR-GENERAL OF THE INDIAN MEDICAL SERVICE

Retrospect

IN ancient times certain ceremonials and customs pointed to the interest taken in hygiene by certain classes of Indians. Eugenics have played an important part in the life of the Brahmins for many centuries. Yet for India as a whole, throughout the ages the one and only health officer has been Nature, whose methods have been excessive reproduction counteracted by disease and famine. Man has added his special checks to population in the form of war and infanticide.

Little is known about the population of India in ancient times. One authority estimates that it was 80 millions in 1650 and 130 millions in 1750, while Sir Frederick Nicholson thinks it was only about 100 millions in 1800. Probably for thousands of years before 1700 the population showed mighty fluctuations between the figures of 30 millions and 100 millions.

Two new factors were introduced by Western influences and the spread of education. (1) The effort to prevent deaths from disease and famine. (2) The increase in production of crops and commodities combined with improved distribution. Under these influences the population increased rapidly and, up to a point, the economic condition of the people improved. Great differences of opinion exist as to whether or not the people are now better off than they were 50 years ago, but the really important matter is their present condition and their future prospects. One basic principle is and will always remain the same: good standards of health and well-being cannot be maintained if the numbers of the people are excessive in comparison with the food-supply.

So far as the controlled populations are concerned splendid results have been achieved by officers of the I.M.S. and R.A.M.C., as can be seen from these figures.

Death-rates

—	British troops.	Indian troops.	Prisoners.
1859	69·0	20·0	100·0
1875	20·0	20·0	—
1900	13·0	11·0	35·0
1912	4·62	4·4	—
1933	2·44	2·39	11·2

In the uncontrolled population similar results have not been possible for obvious reasons. The original policy of the Government of India after control had been taken over by the Crown about 1860 was to avoid imposing any restrictions which might arouse opposition among the people, but instead to popularise modern medicine by opening hospitals and medical schools. By this means combined with the spread of general education it was hoped to create a spirit of goodwill towards preventive medicine. Besides, the total revenues of the Governments of India would have been insufficient to set up a modern public health machinery. Hence attention was concentrated chiefly on vaccination, the provision of water-supplies, and drainage systems.

Medical research has been actively pursued in India and has done excellent work; it was established on an organised basis long before the Medical Research Council was created in England. If preventive medicine had been developed on advanced lines and had achieved complete success, the population of India would probably be 500 millions instead of 370 millions. Where would so many people find adequate food if the present population is already badly nourished?

RESULTS OF A SURVEY

I carried out a survey about four years ago by means of a questionnaire issued to 571 Indian doctors in dispensaries situated in typical agricultural villages throughout India. An analysis of the replies gave the following results. Under 40 per cent. of the people were considered to be well nourished, while over 40 per cent. were regarded as poorly nourished, and 20 per cent. very badly nourished. Few people had suffered from actual hunger during the previous five years but the evidence pointed to serious defects in the quality of the food, especially in the matter of high-grade proteins, fats, and vitamins. The average quantity of milk consumed daily by each person in India was about three and a half ounces. Butter in the form of ghee was taken to the extent of one-third of an ounce daily.

The number of cases of the following diseases at the time of the survey was:—

	Millions.		Millions.
Rickets	2½	Night-blindness ..	3½
Syphilis	5½	Gonorrhœa	7½
Leprosy	½	Tuberculosis of the lung	1½
Other forms of tuberculosis	½	Insanity	½
Congenital mental defects	½	Blindness	2

In the cases of leprosy and blindness the figures are much higher than those shown by the census, but are more likely to be accurate. About 15 per cent. of the school-children had enlarged spleens. The average age at which girls begin to cohabit with their husbands is 14, and the average age of the mothers at the birth of their first child is 16. The maternal mortality-rate works out at about 30 per mille against about 5 per mille in England. Something like ten out of every hundred girl wives are doomed to die in childbirth before they cease to have babies.

These data are not claimed to have statistical accuracy as they are obtained by the process of random sampling and the personal equation enters into the replies but they are claimed to give a true general impression of the real state of affairs in the Indian villages, which of course represent the real India. Whether this rough-and-ready survey is accepted as being reasonably accurate or as being unreliable, it follows that there is an urgent need for a careful investigation of the situation.

OTHER EVIDENCE

The recent official reports show that the birth-rate in India remains constantly high, being about 34 per mille, while the death-rate shows a tendency to decline, being 22 per mille against an average of about 34 between 1901 and 1920. These figures suggest that a very satisfactory degree of improvement is taking place in health conditions, but on the other hand the population is increasing at the rate of 3½ millions yearly in British India alone. It is estimated by Colonel A. J. H. Russell, public health commissioner with the Government of India, that the population of the whole of India, including Burma, will be about 400 millions by 1941. These figures raise the momentous question, will the food-supply be enough to nourish so many people? From the survey which has been described above, it appears that the people must be living very close to the line which separates a bare subsistence from starvation.

* An abstract of two lectures given under the auspices of London University at the London School of Hygiene and Tropical Medicine on Dec. 4th and 6th. In a previous lecture some of the basic principles of public health had been discussed.

Prospect

Prophecy is notoriously unsafe, but a forecast of the future is essential if we are to escape from those disasters which give warning of their approach. Even if the present food-supply were regarded as adequate, provision would have to be made for a 10 per cent. increase during the next ten years. If public health were to bring about a further modest reduction in the death-rate, this increase in the food-supply would have to be about 20 per cent. instead of 10 per cent. It is also reasonable to suppose that an immediate increase of about 20 to 30 per cent. may be found necessary to provide for a proper state of nutrition of the existing population, and to this would be added the recurring increase of about 20 per cent. every ten years to feed the increasing number of mouths. Here is a stupendous task for those who are responsible for the welfare of India. The optimists suggest that the one and only thing needful is to lower the death-rate; they hold that the birth-rate will automatically adjust itself; but in India this is not happening, for, while the death-rate has fallen from about 34 per mille, which was the figure before 1920 to 22 per mille during the years 1932 and 1933, the birth-rate has maintained a steady average of about 34 to 35 during the past few years and shown only a slight decline since the beginning of the present century. Better conditions of life can be secured in India by increasing the production of food and other commodities, by improving the distribution of these, and by diminishing the appalling waste which goes on; but these measures must fail if the increase in the population is more rapid than the increase in the available supply of commodities. If the growth of population continues to occur at the present rate, and the increase in the food-supply is not greatly stimulated, the available surplus must gradually dwindle away till there will be no money to spend on education, medical relief, public health, police, railway travel, commerce, &c., and the country must lapse into barbarism. Nature will then resume her sway and once more there will be a wildly fluctuating balance between population and food-supply. This balance will be struck at a much lower average level, probably at something like half of the present population.

Sceptics will ask: "Do such things happen? Are these not the predictions of scaremongers?" The following two examples are given, one to show what has happened in the past and another to show what is actually happening at present. In Ireland the population increased from one and a quarter millions in 1700 to 4½ millions in 1800, and again to more than 8 millions in 1841 when the people were living in conditions far worse than those of the Indian peasant to-day. Then famine, disease, and emigration caused a ruthless reduction in the numbers of the people, and now only about 4 millions can live in a modest standard of comfort. The present low figure is only retained by extensive celibacy and by greatly delayed marriage; no less than 80 per cent. of the males between 25 and 30 remain unmarried. In the case of Japan, where the population has doubled itself in the past 50 years, and where, despite industrial expansion and strenuous efforts in disease prevention, the death-rate is almost the same as in 1890, whereas it has fallen in England by nearly 50 per cent. during the same period. The infant mortality-rate has risen considerably since 1890 in Japan, while it has fallen in England to a good deal less than half the figure of 1890. A significant point is that the birth-rate in Japan has risen appreciably and is over 30 per mille, whereas in England it has fallen from 31·4 in 1890 to less than half. These figures seem to show that public health actually does fail to achieve success while the population is growing at an excessive rate. If India were able to emulate Japan in the thoroughness of her measures for disease prevention, she could only expect to achieve the same results unless she provided a check to the rapid growth of the population.

WANTED, A PLAN

My aim has been to demonstrate that there is reason for grave anxiety about the present condition of the people of India, and still greater reason for alarm about the future so that a searching inquiry is obviously needed. But some people have no faith in inquiries. They agree that the people of India would resent any suggestion of interference with their customs and religions, and it becomes necessary to convince them that a useful purpose will be served by an investigation such as I have suggested. There can be no doubt as to the practicability of plans for increasing production and for preventing disease, these being two of the limbs of the tripod on which rests the welfare of India; the real doubts are about the third limb, which is the regulation of the population. Contrary to the usual belief, educated Indians are willing and even eager to consider any means of dealing with the evil of over-population. The chief prejudice is encountered among Europeans who wrongly imagine that Indians are antagonistic to any suggestion for reform of their ancient customs. Examples might be given to show the attitude of some western officials and even public health workers who refused to believe that there was any need for intervention or that intervention could serve any useful purpose. On the other hand, many British medical officers and laymen have called attention to the urgency of the situation. The medical research workers, for instance, at their annual conferences in 1923, 1924, 1925, and 1926 unanimously adopted a resolution framed by the writer, in collaboration with the late Major-General Hutchinson, I.M.S., in which the Government of India was appealed to for the appointment of a strong commission, chiefly non-technical, to make a thorough inquiry into the wastage of life and the economic depression.

In the report of the Royal Commission on Agriculture published in 1928 it was pointed out that "it is the duty of Government to investigate basic medical problems and to enunciate and direct sound principles of public health administration," also that "the rural problem should be attacked as a whole and at all points simultaneously." In the concluding chapter these words appear: "the demand for a better life can, in our opinion, be stimulated only by deliberate and concerted effort to improve the general condition of the country side, and we have no hesitation in affirming that the responsibility for initiating the steps required to effect this improvement rests with Government." These weighty words have an added significance as representing the views of the Viceroy Designate. Views of Sir George Newman, Mr. J. H. Hutton, D.Sc., I.C.S., Lieut.-Colonel A. J. H. Russell, Mr. Stanley Baldwin, and Lord Eustace Percy might also be quoted, showing that all these recognised the great urgency of the combined economic, population, and health problem in India.

In his recent presidential address, Sir Gowland Hopkins stressed the need for a comprehensive food policy for England. I cordially agree that a food policy for England is needed. Much more urgent is the need for such a policy in India where it is not merely a question of improving unsatisfactory conditions but of saving the country from a relapse into barbarism. Educated Indian opinion is unanimous in recognising the need for reform: even the educated women are most outspoken in their demand for immediate action to lessen the strain on the bodies and minds of Indian girls who are compelled to endure matrimony at an age when English girls are enjoying a happy childhood.

NATURE OF THE PLAN

Assuming that the proposed committee of inquiry are to find it necessary to prepare a plan, it is suggested that the most effective means of dealing with the situation will be found to consist in education. There are various methods of conveying instruction, but chief reliance will probably be placed

on an India-wide scheme of broadcasting. By this means the whole population, including the women, can be informed of the hard facts of the situation and of the steps which have been taken by other countries to secure comfortable standards of life. In this way they would come to realise the need for a new outlook on life.

There is no need for pessimism, provided that immediate and adequate steps are taken. There are vast possibilities of greatly increasing the production of food and of eliminating waste, such as the maintenance of 25 million useless cattle. The finances of India are in a sound condition, the burden of taxation very light, and the country is free from the anxiety which rests on nations which are highly industrial and therefore dependent on the caprices of world commerce. A concerted national effort such as has been made recently in England would bring prosperity to India, but this would be of short duration unless the people acquire a new outlook on life.

NURSING IN RUSSIA

WE have published from time to time notes on the new Russia from the pens of medical authors. A racy account of the impressions of one of the first party of nurses to pay a professional visit to the Soviet Union, which originally appeared in the *Nursing Times* and has now been reprinted in pamphlet form, records observations from a different angle. The party—all members of the College of Nursing—seem to have used their "nurse's eyes and ears, to note the little significances" to good purpose; for example, they kept a sharp look-out for rickets and impetigo, the total count throughout the trip being only some three or four cases of each. Certain characteristics of Russian nursing emerged: (1) matrons' posts as understood here, with all their responsibilities, are unknown; (2) nurses are divided into two classes, "medical sisters," and "nurses" or orderlies; (3) such refinements as screens and sluice rooms, mops, and scrubbing brushes are not taken as seriously as in this country.

The party visited by appointment the Institute of First Aid, Leningrad, containing 200 beds and specialising in acute abdominal cases. The preliminary interview with the doctors—the matron, if she existed, was not brought forward—revealed that the hospital undertakes research work in acute abdominal cases and compiles mortality and morbidity statistics for general reference. Its findings as to the best time to operate on an acute appendix, for example, are promulgated all over the Union. It is called a "first aid station" because it is open night and day and takes in the accidents and emergencies of the district it serves. It has no out-patient department as such. If a worker in the district falls ill he telephones to the hospital doctor to come and visit him in his home, and if he requires hospital treatment—there is not much home nursing in Russia—he is brought in the ambulance. All workers are made thoroughly aware of the medical facilities in their neighbourhood. As working hours are short in Russia, and hardly any of the doctors or nurses live in, the staff is large. This hospital of 200 beds employed 20 doctors, 30 "medical sisters," and 16 auxiliaries called "nurses." There is no distinguishing uniform. Everybody ties a starchless overall over their outdoor clothes, and a limp white handkerchief over their hair, and everybody wears list slippers (with or without stockings), the slippers often being secured by tape. The medical sisters work six hours a day and the nurses eight. There was at one time a shortage of nurses, but the position is rapidly improving.

The informality in the wards was the subject of comment. The wards in Russian hospitals are small—at most ten-bedded, many two- and four-bedded—and the beds are much lower and closer together than in our hospitals. Visitors are allowed twice in every six days. All the patients have earphones, and all seemed to be reading something. On the stairs between each floor is a sort of letter box in which are collected the patients' personal notes to their friends. These boxes are cleared twice a day; friends call for the notes at the entrance and leave their own replies. They can ring up any time between 10 A.M. and 7 P.M. for news of the patients, and there is one hour in the morning during which they can interview the doctors. The hospital provides nine different diets.

Not only at the Institute of First Aid but at the Lenin Hospital, Leningrad (500 beds, 1000 out-patients, ex-patients only, daily) the visiting nurses were interested by the complete absence of screens, and by the elaborate arrangements for assuring that successive batches of nurses were kept informed of the patients' progress and special needs. As there is a good deal of changing of duty, particulars of really ill patients are written on small squares of frosted glass and slipped in front of a viewing screen on the sister's table. There they are lit up like a series of X ray plates. Changes of treatment are put on cards, a card for each patient, and slipped into the slots of an "album"—just as if they were a collection of picture postcards.

A "wall newspaper" is to be found in every hospital. On it one sees photographs of workers, and also articles of general interest, often of self-criticism. One whole sheet may be devoted to a department which has done poor work, or whose staff have grown slack.

The information sought and gained was not all in one direction. The Russian doctors asked pertinent questions of the British nurses; for instance:—

> "We understand that, unlike our nurses, very few of you are married, and we think it so strange. Speaking as doctors we would even go so far as to say that it is a physiological crime. We hope you do not think us rude to say so." "Not at all," we replied amiably. "But we work longer hours than you and have little time for marriage if it has to be combined with hospital work. Quite a lot of our nurses do marry, but they are expected to give up nursing then. Anyway, do tell us if you think we look ill or strained." Well, they had to admit that we did not, but as we left, with a mutual exchange of smiles and bows, the faint murmur of "physiological crime" pursued us to the very gates.

It had previously been ascertained that besides the annual holiday of two or three weeks, "medical sisters" were allowed four months' pregnancy leave, two months before and two after childbirth. Many other interesting differences of custom were observed and are here entertainingly recorded.

HAMLET ANALYSED AGAIN

THAT artists who concern themselves with character study may on occasion be more trustworthy guides to problems of psychology than professional psychologists is a thesis well worth discussing. Inevitably Shakespeare, whose intuition provides a veritable index to human character, must loom large in such an argument. Now that psychology endeavours not merely to dissect but to coördinate character, it cannot afford to ignore one whose words appear to stimulate each succeeding generation to fresh interpretation.

Dr. Brock, in a little book recently published,[1] enumerates the theory first that Hamlet's "overgrowth of some complexion," of which he was well aware, was passion, secondly, that Hamlet constitutes Shakespeare's portrait of himself. The latter is, of course, only arguable in a limited sense. At some time in his life Shakespeare must have actually experienced the pangs that wrung all his great creations. If Hamlet was indeed Shakespeare in one phase of his life, he passed from that particular phase to others in which idealism gave way to cynicism, as in Antony, Coriolanus, and Timon, and

[1] The Dramatic Purpose of Hamlet. By J. H. E. Brock, M.D., B.S., D.P.H., F.R.C.S. Cambridge: W. Heffer and Sons, Ltd. Pp. 48. 2s. 6d.

gradually thereafter became philosophy as illustrated in the last plays.

Did Hamlet know that his passions would be likely to ensnare him? This interpretation certainly has no support from Bradley; the picture of the final prevailing of passion as a resultant of two opposing forces—the meaner wish for revenge and the higher restraint of idealism—is one well in accord with actual experience. When, however, Dr. Brock takes the dying words of Hamlet to be a cry of despair, we must remember that the excellent Horatio evidently did not interpret them thus. As to the ghost, the old saying "De mortuis nil nisi bonum" has lost its mandatory force among modern commentators. Dr. Brock concludes that old Hamlet had probably been an egotistical bore in the flesh, and though Hamlet naturally idealised his father, other eyes may have perceived some excuse for his wretched queen.

THE HOSPITAL ALMONER

"Go and ask the lady almoner about that. She will be able to help you." This remark may be heard over and over again in any out-patient department when apparently insuperable obstacles are raised by the patient to a line of treatment deemed essential. And to the lady almoner they go, poor, harassed and worried, mental anxiety contributing its full weight to physical illness, and so interwoven with it that it is impossible to cope successfully with either alone. The new edition[1] of "The Hospital Almoner" shows the variety of ways in which the lady almoner is able to solve problems which to the uninitiated might appear hopeless, and the agencies, State or voluntary, which can be tapped; while for intending candidates there has been added a new and helpful chapter which contains useful practical details of the course of training, of previous qualifications essential and valuable, and of the scope of their future work. The book is essentially practical, like the almoner's activities, and it has been compiled with sympathetic insight based on knowledge of the psychological as well as the material aspects of the fine social service it describes.

It is of interest to compare with this general survey this year's annual report of the Social Service Department of St. Thomas's Hospital, whose almoner's department is world-famous. It tells the story of the varying aspects of the work at St. Thomas's, from the struggle to get the slums of Lambeth removed, to the difficult task of finding money for the many activities of the department. On the financial side, it is interesting to note that patients' donations make up about 10 per cent. of the hospital income, and that the average cost of maintaining a patient at St. Thomas's is about 13*s*. per day. Interesting too are the sections on the special departments and on the variety and scope of convalescent work undertaken. The coöperation between the voluntary hospitals and the public authorities is a development which has grown rapidly of recent years. A helpful supplement to the work of both the maternity and the children's department is the "Father's and Mother's" centre, which has an educative value far beyond any centre which caters only for one parent.

HYGIENE IN THE SCHOOL

THE movement for the teaching of hygiene as well as biology in schools has created a demand for elementary text-books which publishers have been alert to satisfy. Dr. Gamlin has written a book[2] intended for teachers in training, for student health visitors, and as a book of reference for school teachers wishing to bring their knowledge of hygiene up to date. It covers a wider range than would be anticipated from its title. Such subjects as heredity, ductless glands, the welfare of infants and young children, air, ventilation, sunlight, personal hygiene, food, beverages, alcohol, infection and immunity, infectious diseases, tuberculosis, rheumatism, and chorea are dealt with as well as school hygiene. The exposition is clear, the information accurate, and emphasis is properly placed.

Dr. Lyster's book[3] is intended to be used in connexion with the class instruction of junior pupils in hygiene. New features in the second edition include a guide to the pronunciation of scientific terms and a revised section on artificial respiration. The book is written in language appropriate to the age of the pupils for whom it is intended, and is freely and, on the whole, well illustrated. There is little to cavil at in the information which it contains, although the relative stress laid on the various aspects of hygiene will not meet the views of some teachers. The section on ventilation would bear modernisation as regards the effects of bad air on health, and it is doubtful if children's memories should be burdened with ingenious but little used ventilating apparatus described here at some length. Some of the diagrams are old fashioned, especially those relating to the stomach and intestines. On the whole, however, this book is a creditable attempt to deal with the difficult subject of hygiene in a way suitable for young children.

BIRTH CONTROL FOR THE LAYMAN

FROM a prefatory note to yet another little book on birth control it appears that Mr. G. R. Scott[4] has written it for the lay public, in order to help married couples to solve their own contraceptive problems and select the method or methods best suited to themselves. He has succeeded only in dishing up a somewhat indigestible hotchpotch. Mixed with a certain amount of correct information are not a few practical blunders and a good deal of material which would have been better omitted. The number of methods described, their various possible and impossible combinations, and the lists of contra-indications and indications for their use must surely be confusing and largely unintelligible to laymen. The diagrams are poor and in one place at least inaccurate. It would be interesting to learn whether the author has had any practical experience of selecting and teaching methods of birth control.

REGULATION OF PROSTITUTION

Miss ALISON NEILANS, general secretary of the Association for Moral and Social Hygiene, writes: "In your issue of Dec. 28th, 1935, Dr. C. Rolleston expresses surprise at Dr. White's statement that the examination of prostitutes in regulationist countries is a perfunctory procedure taking one or two minutes. Dr. Rolleston appears to think that nowadays in Paris and the leading French towns these examinations are managed in a different way and much more thoroughly. I have not seen the periodic examination of prostitutes in Paris or in France, but I have seen it carried out by French specialists in Syria, under the French mandate, where the examinations are conducted for the supposed benefit of the French troops. The examination is still performed very much as described in Flexner's book. It takes rather less than one minute per woman examined, and, in addition, at intervals of a few weeks, I believe, a specimen is taken to examine for gonorrhœa. Also in Turkey at the present time the examination only takes from one to two minutes, but I will not comment on that as on the occasion when I saw it

[1] The Hospital Almoner. Second edition. Prepared by the Committee of the Hospital Almoners' Association. London: George Allen and Unwin Ltd. 1935. Pp. 168. 5*s*.

[2] Modern School Hygiene. By R. Gamlin, M.A., M.B., B.C. Cantab., M.R.C.S. Lond., M.Hy. and D.P.H. Liverp., Chief Assistant School Medical Officer, Liverpool. London: James Nisbet and Co., Ltd. 1935. Pp. 388. 7*s*. 6*d*.

[3] A School Course in Hygiene. Second edition. By R. A. Lyster, M.D., Ch.B., B.Sc. Lond., D.P.H., Lecturer in Public Health and in Forensic Medicine at St. Bartholomew's Hospital, London. London: University Tutorial Press Ltd. 1935. Pp. 266. 3*s*. 6*d*.

[4] Facts and Fallacies of Practical Birth Control. By George Riley Scott, F.R.A.I., F.Ph.S. Eng., F.Z.S. London: T. Werner Laurie Ltd. 1935. Pp. 156. 5*s*.

performed it was only for the purpose of taking smears to look for the gonococcus.

"It is always stated that the prostitute in the brothel under medical examination is not usually the source of infection. In so far as that is true it probably is because women liable to periodic examination keep themselves rather cleaner, but they also take a great number of precautions to prevent being discovered in an infectious condition.

"With regard to the letter from 'Traveller' I might point out that the British authorities have completely abolished the regulation of prostitution throughout the whole of our Crown Colonies and dependencies, including Malta and Gibraltar. In Egypt alone this system of tolerated brothels with medical examination of women continues and the results, judging by the figures for the British Army in Egypt, are not altogether satisfactory."

MEDICAL VERSES[1]

Mr. Roche has brought together here various verses, the majority of which were written over 15 years ago, many of them having seen light in the St. Bartholomew's Hospital journal, Round the Fountain, and the *Busy Bees Magazine*. About one-third of the collection follows the usual type of rhymed skit on medical subjects, though Mr. Roche is both wittier and a better technician than most contributors to hospital journals. The remaining two-thirds contain superior work, and in one or two places display the author as observer and poet. But because some of these metrical exercises are good—note the verses on Chamonix, and the serio-comic obituary note on a blue-bottle—the inclusion of others not so good is regrettable. Some pruning would have raised the standard of the collection, and though great masters of the sonnet have taken liberties in rhyming, it is only they who can take liberties here. The book closes with translations from the Greek and Latin, where several neat renderings of epigrams will be found.

ARTHRALGIA FROM INJECTIONS OF BISMUTH FOR SYPHILIS

A STUDY of the records of the dermato-venereological department of the Rigshospital in Copenhagen has convinced Dr. V. Genner that injections of bismuth not infrequently give rise to more or less troublesome pains in the joints (Nord. med. tidskr., Nov. 2nd, 1935, p. 1753). His study covers the period 1913–32 and concerns 5526 cases of syphilis. Until 1924—i.e., before the bismuth period, and when treatment consisted of injections of mercury and salvarsan—arthralgia as a consequence of anti-syphilitic treatment was unknown. It was only in 1924, the year after the replacement of mercury by bismuth, that such symptoms began to be noticed. Between 1924 and 1932 there were as many as 79 cases of what Genner describes as paratherapeutic ailments of the joints. During the first few years after 1924, the number of cases of arthralgia increased with the raising of the dosage of bismuth; and in the last five or six years, during which the bismuth dosage has been more or less stabilised, there has been a corresponding stability from year to year of the number of cases of arthralgia. As there were 2235 syphilitics treated between 1924 and 1932, these 79 cases represented an incidence-rate of 3·5 per cent. —the same for the two sexes. As a rule, several joints were involved, and the pain was reminiscent of that of rheumatic arthritis. Though it was most exceptional for it to be associated with swelling and redness, the pain could be quite troublesome, and in several cases it persisted for months after the treatment had been discontinued. In two cases its severity necessitated the patients' admission to hospital. In 73 per cent. of all the cases the pain began in the course of the two first series of injections; and the connexion between pain and injection was often so intimate that the former followed the latter with only a quite short interval. It should be noted that the specific treatment given in the Rigshospital included salvarsan in a goodly proportion of the cases, in association with mercury before 1924, and with bismuth from 1924 to 1932; but it is only in a few cases that Genner gives salvarsan the credit for arthralgia. Indeed, only 4 per cent. of the cases of arthralgia occurred during or after a series of salvarsan injections, whereas 54 per cent. of them occurred during or after a salvarsan-bismuth series, and 42 per cent. of them during or after a bismuth series of injections. In several cases undergoing a combined course of salvarsan and bismuth injections, the arthralgia ceased when the bismuth was discontinued and the salvarsan continued; and relapses followed the resumption of bismuth treatment. Dr. Genner's attitude towards the pathology of bismuth arthralgia is guardedly non-committal.

[1] Medical and Other Verses. By Alex E. Roche. London: H. K. Lewis and Co., Ltd. 1935. Pp. 92. 3*s*. 6*d*.

DIARIES

THE HOSPITAL DIARY in its third year of issue elaborates the useful features with which it started. The quality of materials provided for the daily record is unexceptionable, and the opening section containing tabular information and some signed articles on hospital practice and administration are as useful as the hospital buyers' guide which concludes the volume. The diary, which is edited by Lieut.-Colonel Clement Cobbold, secretary of the Cancer Hospital, London, and Mr. H. F. Shrimpton, house governor of the Children's Hospital, Birmingham, can be obtained from G. R. C. Brook and Co., 27, Old Bond-street, London, W.1, for 5*s*. 6*d*.

Warner's CALENDAR OF MEDICAL HISTORY for the use of the medical profession gives a page for each day's record of events, and at the foot of each page is a useful calendar and some interesting item of medical biography or history. Tables of incompatibles, of poisons, of infectious diseases, of glandular secretions, and many others, contain much useful information attractively arranged. The calendar which is printed in the U.S.A. is issued by William R. Warner and Co., Ltd., 300, Gray's Inn-road, London, W.C.1.

THE PREVENTION OF NEUROSIS

Sir Walter Langdon-Brown has distinguished between those ill from unhappiness and those unhappy from illness. A large proportion of patients, even in favourable circumstances, owe their maladies to psychological maladaptation and it is therefore to be expected that in industry neurotics are responsible for much lost efficiency. Statistics have shown that in one factory there may be a sickness-rate of 3 days a year, while in another, where discontent is rife, it rises to 16. This difference seems chiefly to be due to psychological ill-health and, in a paper read before the Society of Medical Officers of Health on Dec. 20th, 1935, Dr. Henry Wilson discussed the causes of neurosis and showed how the methods of preventive medicine could be applied to the problem.

Inborn or physical handicaps, environmental difficulties, or unsatisfactory psychological habits are, he said, the factors which produce absence from work or chronic discontent. The neurotic settles these problems by evasion, but to classify his condition with moral defect is to hamper the psychologist in his already difficult task. Efficient treatment should be preventive in its aims and it is only by finding the cases in childhood that neurosis in the working adult can be excluded. About a tenth of all school-children are seriously backward in mentality, and this has probably a greater bearing upon crime and neurosis than is realised. The neurotic child, though overstrung and shy, tends to have an intelligence superior to his fellows, and he is at once at a disadvantage if his capabilities are either misunderstood or repressed. The attempts to assess the discrepancy between mental age and educational position are in the realm of preventive

medicine, for there the individual child can be studied, his needs discovered, and his emotions trained. The psychologist can detect early traits even before their importance is seen by the most intuitive teacher, and these can be treated before they become serious habits of mind.

Circumstances such as physical disease can be improved or the patient's attitude adjusted by satisfactory education and suitable employment. Attempts can be made, especially in the young, to remedy abnormal outlooks and reactions, but often the child's enemies are those in his own household, and the parents are to blame for the bad environment. It is here that the psychiatric social worker becomes indispensable to the clinician in dealing with neurotic manifestations. The object of the medical psychologist is to pick his material and to aid the children to have their values readjusted, not by taboos and social ostracism, but by a real sense of self-control.

Dr. Wilson looks forward to the time when the medical psychologist can apply to early cases what preventive medicine has offered to those physically diseased, when, by means of investigation, early notification, suitable environment, and complete treatment, he can make the misfit an asset instead of a burden to society.

NEW PREPARATIONS

DISSOLVED VACCINES G.L.—Under this name the Glaxo Laboratories Ltd., Greenford, Middlesex, are issuing vaccines "in which the bacterial cells are in solution and the toxic bacterial products are at the same time detoxicated." With ordinary vaccines an antibody response does not develop until antigens have been liberated from the bacterial cell by tissue lysis at the site of inoculation. Dissolved Vaccines, on the other hand, are said to make the antigens immediately available, and their action is therefore more rapid and consistent. Both solution and detoxication are effected by sodium lauryl sulphate which is present in the vaccines at a concentration of not more than 0·025 per cent. Owing to the detoxication, which affects endotoxins and exotoxins equally, the general level of dosage can, it is stated, be considerably higher than that of ordinary vaccines; indeed it is often possible to give a full dose at the first or second injection, no long series of graduated doses being necessary. Good clinical results obtained during the past two years are described in a booklet which may be had on application. The vaccines are put up in rubber-capped bottles in the following varieties: acne and staphylococcus, anti-typhoid-paratyphoid, cold (prophylactic), cold (treatment), influenza, staphylococcus and streptococcus, staphylococcus, streptococcus, whooping-cough (prophylactic), whooping-cough (treatment), gonococcus, and Shiga's dysentery bacillus. Autogenous vaccines can also be prepared.

CLAUDEN is a preparation of lung tissue recommended for the control of hæmorrhage. In the form devised by Fischl in 1916 it is a greyish-brown amorphous powder which can be applied as a local styptic. Besides this powder the Luitpold-Werk, Munich, now prepares a solution in ampoules—for intravenous, subcutaneous, and intramuscular injection, for irrigation of wounds and tooth-sockets, and for instillation into rectum or bladder—and tablets for protracted administration by mouth. All three forms are obtainable in this country from the Medical Laboratories Ltd., 40, Pall Mall, London, S.W. 1. It is claimed that the active principle is not impaired by alimentary digestion, and that after absorption or injection it never causes intravasal coagulation, its action being confined to the point where the blood-vessel is injured. The use of Clauden is advised not only for the prevention and treatment of surgical oozing but also for such conditions as hæmoptysis, nose-bleeding, menorrhagia, and hæmorrhage from the bladder. The makers issue a pamphlet based on over 350 references in medical publications, including an observation by Knosp (1928) that Clauden reduces coagulation time by about half. Prolonged administration is reported to have overcome the tendency to hæmorrhage in hæmophilia.

ESTOFORM.—The chief constituent of this new antispasmodic remedy is an ester of formic acid, with the formula $HC(OC_2H_5)_3$, which is shown to be non-toxic to animals in doses as high as 5 grammes per kg. of body-weight. Estoform contains 10 per cent. of this ester, together with extracts of *Prunus virginiana* and senega, in a glycerin-spirit base, and doses up to 6 teaspoonfuls were given during clinical trials. The spasm of chronic and acute bronchitis was relieved, patients with miscellaneous coughs were mostly benefited, and definite improvement is said to have been obtained in a large proportion of asthmatics. It should be noted that this preparation contains about as much alcohol as ordinary spirits and requires to be diluted and taken preferably with meals. It is made by the Crookes Laboratories (British Colloids Ltd.), Park Royal, London, N.W.10.

THE OBSTINATE SYRINGE

Dr. C. S. RYLES writes: Having tried, without success, all the usual means for dealing with a valuable glass syringe whose piston was stuck in the barrel, I soaked the syringe in a little "penetrating fluid" such as motorists use for spraying the spring leaves of cars. After a week the piston came out easily. Probably others would be glad to know about this.

Medical Diary

SOCIETIES

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.
TUESDAY, Jan. 7th.
Orthopædics. 5.30 P.M. (Cases at 4.30 P.M.) Mr. Denis Browne: Club-feet. Mr. Alan Todd: Pes Cavus.
THURSDAY.
Tropical Diseases and Parasitology. 8.15 P.M. Dr. J. C. Cruickshank: Modern Methods of Diagnosis by Agglutination.
FRIDAY.
Ophthalmology. 8.30 P.M. (Cases at 8 P.M.) Mr. J. H. Doggart: Eclamptic Detachment of the Retina.

SOUTH-WEST LONDON MEDICAL SOCIETY.
WEDNESDAY, Jan. 8th.—9 P.M. (Bolingbroke Hospital, Wandsworth Common, S.W.), Dr. H. Crichton-Miller: The Neurotic as the Practitioner's Bogy.

WEST KENT MEDICO-CHIRURGICAL SOCIETY.
FRIDAY, Jan. 10th.—9 P.M. (Miller General Hospital, Greenwich, S.E.), Clinical evening.

WEST LONDON MEDICO-CHIRURGICAL SOCIETY.
FRIDAY, Jan. 10th.—8.30 P.M. (West London Hospital), Dr. Halls Dally, Dr. L. S. T. Burrell, and Dr. Evan Bedford: Pain in the Chest.

LONDON JEWISH HOSPITAL MEDICAL SOCIETY, Stepney Green, E.
THURSDAY, Jan. 9th.—4 P.M., Mr. A. D. Griffiths, Mr. H. A. Kisch, and Dr. C. C. Worster-Drought: Headaches.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY, Jan. 6th, to SATURDAY, Jan. 11th.—ST. JOHN'S HOSPITAL, 5, Lisle-street, Leicester-square, W.C. Afternoon course in dermatology.—WEST END HOSPITAL FOR NERVOUS DISEASES, In-patient Department, Gloucester-gate, N.W. Demonstration on Fundus Oculi, by Mr. R. Lindsay Rea, at 8.30 P.M., on Tuesday, Jan. 7th.

LONDON SCHOOL OF DERMATOLOGY, 49, Leicester-square, W.C.
TUESDAY, Jan. 7th.—5 P.M., Dr. H. Corsi: Syphilis through Four Centuries.
THURSDAY.—5 P.M., Dr. J. M. H. MacLeod: Ringworm Infections.

ST. JOHN CLINIC, Ranelagh-road, S.W.
FRIDAY, Jan. 10th.—4.30 P.M., Dr. Philip Ellman: Physical Methods in Diseases of Heart and Lungs.

GENERAL INFIRMARY, Leeds.
TUESDAY, Jan. 7th.—3.30 P.M., Dr. Veale: Demonstration of Medical Cases.

LEEDS PUBLIC DISPENSARY AND HOSPITAL.
WEDNESDAY, Jan. 8th.—4 P.M., Dr. Hartfall and Dr. Garland: Diagnosis and Treatment of Rheumatoid Arthritis.